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Policy Options to support the Rural Job Opportunity Creation Strategy in Ethiopia

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Abstract

In 2017, the Ministry of Agriculture and Natural Resources of Ethiopia adopted the Rural Job Opportunity Creation Strategy (RJOCS) to address a lack of job opportunities in rural areas, and related effects such as migration to urban areas and poverty. This report assesses the likely effects of six policy options, in terms of jobs opportunity creation and key macroeconomic indicators. It employs a dynamic Computable General Equilibrium (CGE) model developed by the Joint Research Centre (JRC) tailored to the Ethiopian context.

The analysis of the Ethiopian economy, through multipliers based on a specifically developed database, shows that livestock has the greatest employment generation capacity, followed by cash crops, food crops and agri-food industry. This means that policies focusing on rural and agri-food sectors should have great potential to create job opportunities.

All scenarios show the capacity of the Ethiopian agriculture and food industry to generate job opportunities and improve conditions for workers and their families, with particularly positive effects under the scenarios supporting agroparks and developing workers' skills through education.

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Executive summary

To address a lack of job opportunities in rural areas, especially for young people, and related effects such as migration to urban areas and poverty, the Ministry of Agriculture and Natural Resources of the Federal Democratic Republic of Ethiopia adopted a Rural Job Opportunity Creation Strategy (RJOCS) in 2017. This report aims to quantify several policy options within the framework of the RJOCS. It uses the Dynamic Equilibrium Model for Economic development, Resources and Agriculture (DEMETRA), which is a national Computable General Equilibrium (CGE) model developed in-house by the Joint Research Centre (JRC) of the European Commission and tailored to the Ethiopian context.

Policy context

Six policy scenarios simulate the existing policy mixes of the Ethiopian government. Beyond the RJOCS, these include key documents such as the second Growth and Transformation Plan (GTP II) and the Climate Resilient Green Economy (CRGE) Strategy. The identified scenarios address the development of: (i) industrial agro-processing parks, (ii) rural roads and infrastructure, (iii) irrigation facilities, (iv) livestock extension services, (v) productive safety net programme (PSNP) or labour subsidy, and (vi) rural skills enhancement.

Key conclusions

The analysis of the Ethiopian economy through multipliers shows that livestock has the greatest employment generation capacity, followed by cash crops, food crops and agri-food industry. This means that policies focusing on rural and agri-food sectors should have great potential to create job opportunities.

Policy scenarios show good absorption capacity and job creation possibilities for agri-food sectors if stimulated by specific policies, particularly with increasing investments in agro-processing industrial parks (agropark). The report sheds some light on the need for prioritisation in public spending, consistent with policy objectives. That being said, modelling outcomes should be considered with caution and should in no way be considered forecasts of any future impacts of simulated shocks.

Main findings

All scenarios simulated show potential for agriculture and food sectors to increase job creation, particularly if stimulated with investment policies such as the development of agroparks. The increase in labour demand brings about an almost universal increase in wages under most scenarios. This increase is particularly significant under scenarios specifically designed to increase labour productivity, such as the skills scenario which is helping to create better jobs with higher pay. Total employment is barely affected by the policies simulated. This is also due to the structure of the model and lack of available data on Ethiopian employment or underemployment

An additional effect of policies fostering rural job opportunities is the reduction in worker migration towards urban areas, in particular Addis Ababa. The positive outlook associated with the policies simulated is underlined by the increase in production factor income and consequently household income associated with most scenarios. The only one associated with a decline in income is the labour subsidy. This scenario is able to support the income of the poorest, but at the same time creates distortion in the economy, reducing overall economic activity compared to the baseline. To avoid these negative effects, this policy should be accompanied by pro-growth ones to avoid a decrease in Ethiopian economic growth.

Related and future JRC work

Enhancing the analysis of Sustainable Development Goal indicators and better capturing strong dynamics such as demography or climate change will represent critical improvements.

1 Introduction

About 80% of the Ethiopian population lives in rural areas (Central Statistics Agency (CSA), 2016). Although the unemployment rate in rural areas is estimated to be around 2% (MoANR, 2017), the majority of the rural population are young people with limited access to land or other means of agricultural production; most of them plan to quit agricultural production in the near future (Bezu and Holden, 2014) although rural non-farm employment opportunities are quite limited (Schmidt and Bekele, 2016). The lack of job opportunities in rural areas is one of the core reasons for the migration of young people to urban areas (Atnafu et al., 2014). According to a recent study, 28% of young people in the Blue Nile Basin in Amhara and Oromia permanently migrated to urban areas between 2010 and 2014 (Kosec et al., 2017). However, an already high rate of unemployment in urban areas of 16.5% (MoANR, 2017) indicates that those who move to cities for better job opportunities face significant constraints in finding jobs.

The Ministry of Agriculture and Natural Resources (MoANR) of the Federal Democratic Republic of Ethiopia has developed and adopted a Rural Job Opportunity Creation Strategy (RJOCS) (MoANR, 2017) to consolidate the government's rural job opportunity creation activities, at federal and regional levels, in line with the priorities of the second Growth and Transformation Plan (GTP II) and the Climate Resilient Green Economy (CRGE) Strategy.

The RJOCS is targeting rural job seekers, primarily unemployed and underemployed women and men over 15 years of age, literate or illiterate, and those without regular and sufficient income. Potential beneficiaries of the strategy also include landless and early school leavers, technical and vocational trainees, university graduates, farmers evicted from their land due to the expansion of urbanisation and industrialisation, and those who need special support because of disability.

The RJOCS aims to harness all achievements recorded so far in social services and infrastructure development in rural areas, including:

- rural road development: expansion and access to road connectivity;
- human health care services: health posts, health centres and hospitals;
- animal health services: veterinary posts/clinics;
- provision of drinking water: putting in place institutions responsible for the provision of drinking water for humans and livestock;
- telecommunication services: telephone, mobile and internet services;
- education: pre-school and adult education, elementary, secondary, technical and vocational training institutions;
- rural financial institutions: banks, saving and credit unions, multipurpose cooperatives;
- training centres: farmer and pastoralist training centres;
- irrigation facilities; water users' associations, construction and maintenance crews;
- other rural infrastructure facilities such as market infrastructures and the forthcoming agro-industrial parks.

The RJOCS also aspires to harness private sector development and market linkages, and increase access to new technologies, innovations, and applications brought by increasing connectivity. The strategy aims to capitalise on the following enablers:

- prioritising unemployed and youth and women in job opportunity creation;
- providing more emphasis on the marginalised in job opportunity creation;
- contributing to the reduction of poverty through prioritising in job opportunity creation those living with a high poverty profile;
- enhancing local and national growth and transformation through promoting job opportunity creation;
- associating job opportunity creation with the development of rural entrepreneurship;
- creating jobs to incentivise job seekers to spend more time on their job, generate better remuneration and engage in sustainable jobs;

- empowering young people: letting the youth guide their own issues, hear their voice and use their wisdom;
- integrating national economic growth and transformation with job opportunity creation.

The RJOCS has four strategic pillars:

- Pillar 1: Entrepreneurship/self-employment - private development
- Pillar 2: Wage employment, labour markets
- Pillar 3: National rural employment guarantee scheme: expanded productive public workfare programme
- Pillar 4: Livelihood diversification

However, despite its importance, the RJOCS is neither quantified in its objectives, nor has it been accompanied by an impact assessment or cost-benefit analysis for the economy, making it difficult to prioritise government investments and monitor the impacts of the strategy. Furthermore, the strategy has not yet defined its needs in terms of operational policies and specific institutional arrangements.

This report fills the gap by proposing a quantitative analysis of the policy options within the framework of the RJOCS. It uses the Dynamic Equilibrium Model for Economic development, Resources and Agriculture (DEMETRA), a single-country Computable General Equilibrium (CGE) model developed by the Joint Research Centre (JRC) of the European Commission and tailored to a developing country context. The rest of the report is organised as follows: section 2 provides a brief description of the policy context; section 3 describes the model and the data used in the study, and shows an analysis of employment multipliers; section 4 introduces the simulated policies; and section 5 reports the main results from the simulations. The last section concludes and provides some policy recommendations.

2 Policy context

Agriculture is the backbone of the Ethiopian economy. The sector employs 78% of the country's labour force (CSA, 2016). It is characterised by subsistence farming, heavily dependent on erratic rainfall. Most farmers are smallholders, practising low input and low output farming on highly fragmented land (CSA, 2016). This causes open and tacit underemployment that exacerbates rapid rural-urban migration. According to the Ethiopia Urban Migration Survey (UMS) the rate of rural-urban migration was 15% in 2008, and it was projected to reach as high as 39% between 2009 and 2014 (World Bank, 2010). This trend signifies that an increasing number of people will migrate to urban areas, taking into account that nearly 80% of the population currently lives in rural areas (CSA, 2016). Typically, people moving to urban areas do not have the required skills to engage in formal productive economic activities, and therefore often engage in low return activities and are vulnerable to food insecurity and poverty (Battersby, 2011).

The low absorptive and employment generation capacity of urban areas urged the Ethiopian government to design strategies to create employment opportunities for rural youth. Until recently, unemployment was considered an urban phenomenon; hence policies focused on reducing urban unemployment. For example, the first Growth and Transformation Plan (GTP I) placed more emphasis on combating urban unemployment in Ethiopia. The rural component of GTP I was mainly focused on improving agricultural productivity and less attention was given to employment creation. This amplified rural unemployment and rural-urban migration, while urban unemployment fell from 18.9% to 16.9% between 2010 and 2016.

In light of recent migration dynamics, creating job opportunities for youth in rural areas became part of various policy packages. Unlike GTP I, GTP II identified agriculture as an enabler of rural youth employment. The plan provided support to educated youth to engage in agricultural investment. One of the measures considered was increased supply of agricultural inputs and enhanced utilisation of agricultural technologies. This measure should enhance provision of the necessary support for domestic and selected foreign investors to enable them to participate in transformative agriculture (NPC, 2016).

Creating employment opportunities for rural youth in rural areas was also mainstreamed by sectoral plans and growth programmes: the Agriculture Growth Programme (AGP), Livestock Master Plan (LMP), Livestock and Fisheries Sector Plan (LFSP) and Sustainable Land Management Programme (SLMP). The AGP aims to generate rural employment through improving agricultural productivity and commercialisation of targeted smallholder farmers, increasing participation by women and youth, and contributing to dietary diversity and household consumption (MOA, 2015). The LMP and the LFSP aim to transform the livestock sector. Young people are among the primary beneficiaries of these programmes. The SLMP plays a crucial role in addressing climate resilience and the green economy; it mainstreamed green economy needs into sectoral programmes at all levels and has been configured to the safety net programmes.

The government endorsed the Rural Job Opportunity Creation Strategy (RJOCS) in May 2017. The strategy targets rural job seekers, primarily the unemployed and underemployed over 15 years of age, and those without regular and sufficient income. Potential beneficiaries of the RJOCS also include landless and early school leavers, technical and vocational trainees, university graduates, farmers evicted from their land due to urbanisation and industrialisation, and those who need special support because of disability. The strategy relies on four pillars to generate employment opportunities for youth: (1) entrepreneurship and self-employment, (2) wage employment in labour markets, (3) national rural employment guarantee scheme, and (4) rural livelihood diversification. The RJOCS identified the main job opportunities under each pillar. For instance, agriculture (crop and livestock), natural resource, and non-farm activities are identified as the main job opportunity under the entrepreneurship and self-employment pillar (MoANR, 2017).

1. Entrepreneurship/self-employment

Educated youth could be attracted to entrepreneurship and self-employment opportunities. To this end, young job seekers are encouraged to participate in micro, small and medium enterprises, and to engage in activities suited to the environmental context and economic development. Rural enterprise development is implemented in the form of cluster or business community models. These approaches ease management; facilitate technical support including service provision, knowledge and technology transfer; and forge an interface between businesses and enhanced value chain. The main opportunities for rural entrepreneur development include agriculture (crop and livestock), natural resource-based, and non-farm activities. These sectors mainly embrace fruit and vegetable production, spice production, improved seed production, animal and fishery sector, livestock, camel development, pig farming[1], fishery, apiculture, silk production, animal feed production,

[1] Pig farming is an important activity in view of growing demand, but requires more engagement to break cultural and religious taboos.

hides and skins, off-farm/non-farm sectors, small business enterprises, small-scale industries such as wood and metal workshops, tailoring and sewing, weaving and pottery making.

2. Wage employment, labour markets

This part of the strategy targets job seekers who have specific skills and knowledge and are willing to transfer. This is a way of linking rural youth to existing job opportunities in rural and urban areas through the provision of information. This component focuses on finding rural youth permanent jobs in rural institutions/cooperatives, the private sector and lowest government hierarchy, and temporary employment opportunities in megaprojects such as sugar factories or dam construction. Overseas employment opportunities have also been part of the policy package, through providing skills/language training for the rural unemployed.

3. Productive public workfare programme

The government places a focus on employing the rural labour force in labour-intensive programmes and initiatives. The major job opportunities are in wage employment in rural socioeconomic development priorities (infrastructure, natural resource management, irrigation, etc.). Job seekers will be provided with sufficient working days and income through wages to support their livelihoods. Districts (*woredas*) will produce their respective plans for job opportunities and will ensure job seekers access the information. Job seekers will be selected through self-targeting, community targeting and administrative targeting. A strong and sufficient annual financial budget will be allocated to create rural job security. Among rural employment guarantee schemes, the pertinent ones are: community watershed development through social mobilisation, Universal Road Access Programme (URAP), small-scale irrigation schemes, Sustainable Land Management Programme (SLMP), and Productive Safety Net Programme (PSNP).

4. Livelihood diversification

This component focuses on diversifying the source of livelihoods of households vulnerable to various income shocks. This programme is more appropriate to underemployed than to unemployed people. Governmental and non-governmental organisations support livelihood interventions to improve household and individual incomes, build household assets and strengthen saving, to enhance the living standard of the rural population. There are also instances of financial allocation in the form of grants and community revolving fund, aiming to support the poor to engage in income-generating activities. Through time, the implementation approach has also been improving: moving from supply to demand driven and to value chain building efforts. Empirical evidence indicates that the provision and utilisation of loan financing and a saving culture has improved throughout the country. The approaches to be followed in enhancing livelihood diversification are social enterprise development that supports the poor, and business-oriented livelihood pathways (farm, off-farm and employment opportunities).

3 Data and Model

3.1 Social Accounting Matrix

A Social Accounting Matrix (SAM) is a comprehensive and economy-wide database recording data about all transactions among all economic agents in a specific economy for a specific period of time, showing a complete and intuitive snapshot of an economy (Mainar-Causapé et al., 2018). A SAM is a square matrix in which each account is represented by a row and a column. Each cell shows the payment by column account to the account in the row. Therefore, 'receipts' or incomes for an account are shown along the row, and 'expenditures/payments' in the column. In each SAM, revenues correspond to payments, so the total of each row equals the corresponding column total.

An original SAM for Ethiopia was estimated for 2015/16[2], jointly by the Ethiopian Development Research Institute (EDRI)[3] based in Addis Ababa, and the JRC Seville. This is especially noteworthy as there is no input-output framework from which to build the SAM. The estimation is based on microdata from various statistical sources. Following preliminary data work, an initial SAM was obtained with additional statistical information, adjusted with official macro-magnitudes, adequately balanced and refined. This process produced a highly disaggregated SAM, consistent with Ethiopian economy figures (see Mainar-Causapé et al., 2019 for all technical details related to the SAM construction).

The main databases used to estimate the SAM for Ethiopia, most of them the latest available at the time of elaboration of the SAM and provided by the Central Statistical Agency of Ethiopia (CSA) are the following:

- 2014/15 and 2015/16 National Accounts Statistics, NAS (CSA)
- 2015/16 Ethiopian Household Consumption – Expenditure Survey, HCE (CSA)
- 2015/16 Ethiopian Socioeconomic Survey, ESS (CSA and World Bank)
- 2007 Population and Housing Census (CSA)
- 2015/16 Data from Ministry of Finance and Economic Cooperation (MoFEC)
- 2015/16 Indicators from National Bank of Ethiopia (NBE)
- 2015/16 Balance of Payments Database from National Bank of Ethiopia (NBE)
- 2015/16 Large and Medium Scale Industries Survey (CSA)
- 2015/16 Data from Ethiopian Revenue and Customs Authority (ERCA)
- 2014/15 and 2015/16 Retail and producer price survey data (CSA)
- 2013/14 Labour Force Survey (CSA)
- 2015/16 Smallholder agricultural sample survey, AgSS (*belg* and *meher*) (CSA)
- 2015/16 Commercial farms survey, CFS (CSA)
- 2015/16 Livestock agricultural sample survey, LAgSS (CSA).
- 2015-16 Land Use Survey Report (CSA)
- 2015-16 Area and crop production report (CSA)
- 2015/16 MAFAP Public Expenditure Database (MAFAP-FAO)

For illustrative purposes, the resulting macro SAM (SAM aggregated by main groups of accounts) is shown in Table 1.

[2] Note the fiscal year 2008 in the Ethiopian calendar covers, approximately, June 2015 to June 2016.

[3] This research work also involved collaboration with the Policy Study and Research Centre (PSRC), which was merged with EDRI during writing of this report.

Table 1. Macro SAM for Ethiopia 2015/16 (ETB million)

	Activities	Commodities	Factors	Enterprises	Households	Government	Taxes	Investment	Rest of the World	Total
Activities		2,151,741								2,151,741
Commodities	735,638				1,099,313	148,837		588,705	122,366	2,694,859
Factors	1,416,103								9,282	1,425,386
Enterprises			509,423			5,595			277	515,295
Households			910,486	369,922		11,211			127,340	1,418,959
Government				18,729	8,298		188,892		28,570	244,489
Taxes		118,590		41,207	29,096					188,892
Saving				84,828	279,600	73,063			151,215	588,705
Rest of the World		424,528	5,478	610	2,652	5,783				439,051
Total	2,151,741	2,694,859	1,425,386	515,295	1,418,959	244,489	188,892	588,705	439,051	

Source: Own elaboration

Due to the special data needs for the model, the SAM for Ethiopia has a specific structure, incorporating accounts for the treatment of Home Production Home Consumption (HPHC) (Aragie et al, 2015) and high regionalisation. The concept of HPHC is introduced in the SAM by assuming that households have a 'production component'. Besides the classic Representative Household Groups (RHGs) that collect household behaviour as consumers of goods and services and as providers of factors of production (and receptor-contributors of transfers), the SAM includes new accounts incorporating the behaviour of households as units of production of commodities. These accounts integrate the economic behaviour of households as producers of food commodities, i.e. agricultural, livestock and fish products. This requires separation of accounts for commodities produced by these households for own consumption (HPHC as input or as final product) and other marketed commodities (produced by households and through conventional productive activities). Rows of these commodity accounts reflect the use of HPHCs as intermediate inputs in the productive activities of households, and their consumption in the final demand of households. Their row sums must be equal to the sums of the columns that summarise the contributions of the activities of households for each of these goods. Similarly, columns of the households activities show how they use inputs (HPHC and marketed), while rows show the destination of their production as inputs, own-consumption goods or marketed commodities. Households considered as producers are broken down regionally (one household category for each region considered), although commodities are sold as homogenous goods on the national market.

The basic structure of the SAM for Ethiopia 2015/16 is shown in Annex 1 (Table A1.1), and the breakdown of commodities and activities is summarised in Table 2.

Representative households are disaggregated following the 11 administrative regions of Ethiopia: *Addis Ababa*, *Afar, Amhara, Benishangul-Gumuz, Dire Dawa, Gambella, Harari, Oromia, SNNP, Somali* and *Tigray*. Each household is further disaggregated into three categories: *rural*, *small towns*, *medium and large towns/cities*. Note that for some regions, not all three zones are covered.[4] Finally, 28 RHGs are included.[5]

The SAM accounts for three types of agricultural production agents: 11 household agricultural activities (*ahf*), one per administrative region, producing 23 'subsistence commodities' not marketed and consumed at home, and 15 marketed crops. The national activities sectors (representing the market-oriented larger holder producers) produce food and cash crops.

[4] In Addis Ababa, only the category *medium and large towns/cities* is considered. Furthermore, in Benishangul- Gumuz *medium and large towns* is omitted, as is *small towns* in Diredwa and Harari.

[5] A SAM traditionally adopts the concept of Representative Household Group (RHG), where different households group are represented by an aggregated account. The assumption is that all individual households in an RHG are, on average, affected in the same manner by a policy shock. Thus, in forming household groups, it is very important to consider similar preferences and characteristics (similar households are more likely to be affected similarly by economic shocks).

Table 2. Activities and commodities disaggregated in Ethiopia SAM 2015/16

HPHC commodities	Marketed commodities			Representative Households Groups as activities	Activities	
Teff	Teff	Cotton	Cement	Addis Ababa	Growing of food crops	Manufacture of paper publishing; printing
Barley	Barley	Animal products nec (not elsewhere classified)	Metals nec	Afar	Growing of cash crops	Manufacture of chemicals, rubber and plastic products
Wheat	Wheat	Forestry	Metal products	Amhara	Growing of coffee	Manufacture of pharmaceuticals
Maize	Maize	Fishing	Motor vehicles and parts; other transport equipment	Benishangul-Gumuz	Growing of crops nec	Manufacture of mineral products
Sorghum	Sorghum	Minerals nec	Electronic equipment	Dire Dawa	Growing of flowers	Manufacture of cement, lime and plaster
Pulses	Pulses	Vegetable products; animal oils and fats	Machinery and equipment nec	Gambella	Raising of cattle	Manufacture of basic iron and steel
Vegetables nec	Vegetables nec	Dairy products	Manufactures nec	Harari	Raising of sheep	Manufacture of metal products
Oil seeds	Oil seeds	Sugar and sugar confectionary	Electricity	Oromia	Raising of goat	Manufacture of ovens, furnaces and furnace burners
Sugar cane	Sugar cane sugar beet	Grain mill products and grain mill services	Water	SNNP	Raising of camel	Manufacture of accumulators, cells and batteries
Fruit Crops	Fruit Crops	Food products nec; animal feeds	Construction	Somali	Raising of poultry	Manufacture of bodies (coachwork) for motor vehicles
Tea	Tea	Beverages	Trade and repair services	Tigray	Raising of other animals	manufacture of medical equipment
Chat	Chat	Tobacco input Products	Hotels and restaurants		Forestry	Manufacture of furniture

Coffee	Coffee	Manufactured Tea	Transport services
Enset	Enset	Manufactured Tobacco	Communication
Cereal grains and other crops nec	Cereal grains and other crops nec	Linted cotton	Financial services
Cattle	Animal feed	Textiles	Business Services
Sheep	Cut flowers	Wearing apparel	Public administration and defence
Goat	Cattle	Leather products	Education
Camel	Sheep	Wood products	Health
Poultry; Other small livestock	Goat	Paper products publishing	Recreation and other services
Animal products nec	Camel	Petroleum coal products	Real estate and renting services
Raw milk	Poultry; Other small livestock	Fertilisers	
Forestry	Meat products	Chemicals, rubber and plastic products	
	Manure (animal product)	Pharmaceutical Products	
	Raw milk	Mineral products nec	

Source Own elaboration

Fishing	Electricity
Mining and quarrying	Water
Manufacture of dairy products	Construction
Manufacture of grain mill products	Wholesale and retail trade; repairs
Manufacture of sugar	Hotels and Restaurants
Production, processing and preserving of meat	Transport
Distilling, rectifying and blending of spirits	Communication
Manufacture of tobacco products	Financial intermediation
Finishing of textiles	Public administration
Preparation of textile fibres; weaving of textiles	Education
Manufacture of wearing apparel except fur apparel	Health and Social Work
Tanning and dressing of leather	Real Estate, Renting and Business Activities
Wood and wood products	Business Activities

Three types of labour are considered: skilled, semi-skilled and unskilled. Each labour type is regionalised by administrative region; the SAM thus accounts for 33 types of labour. The capital factor is disaggregated into *land*, *livestock* and *non-agricultural capital*.

The SAM considers specific accounts for *direct taxes*, *indirect taxes* on commodity sales (including value-added taxes), and *import taxes* to address fiscal policies.

In summary, the SAM for Ethiopia 2015/16 consists of 227 accounts: 61 activities (11 of them accounts for households as producers), producing 71 marketed and 23 HPHC commodities, using 3 types of labour (skilled, unskilled and semi-skilled) in 11 administrative regions (33 labour accounts), 3 types of capital, 3 types of taxes, 28 regionalised RHGs and one account each for *margins, saving-investment, enterprises, government* and *rest of the world.*

To satisfy the simulation needs of this report, an extended version of the SAM has been estimated with 255 accounts. This SAM splits the capital land factor into 22 accounts, since land is divided into irrigated and non-irrigated for each administrative region. Furthermore, the investments account is disaggregated into *roads*, *irrigation* and *other investments* (which includes all other investments types). Moreover, *input subsidies* are separated from the indirect tax account for specific commodities. A commodity *extension services* has been disaggregated from the production of *public administration services*.

3.2 Job multipliers analysis

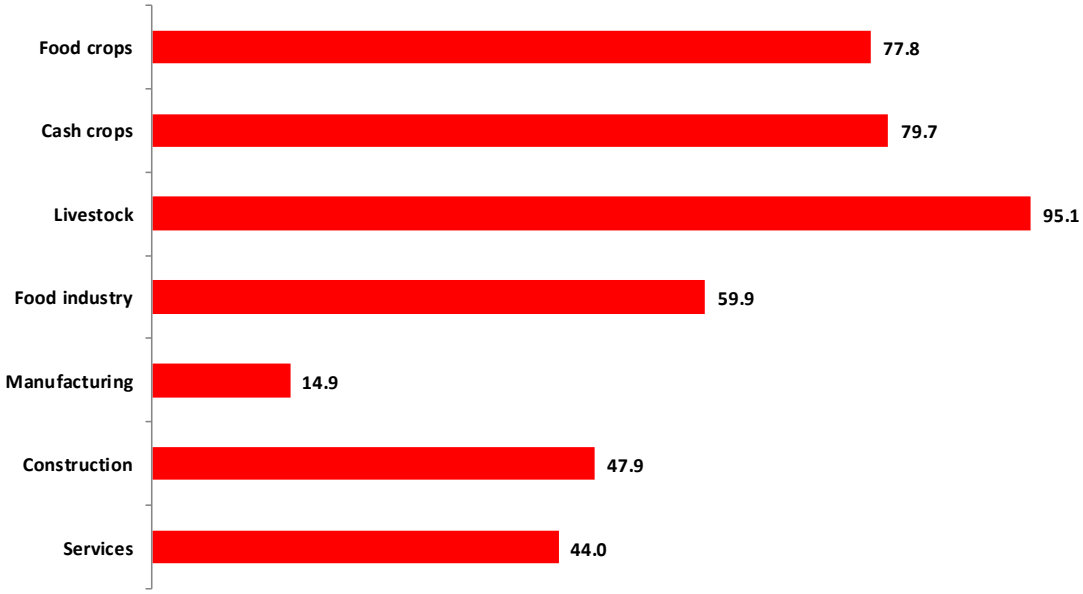
Derived from the SAM and Input-output framework, the analysis of linear multipliers is a useful tool to assess the potential of economic sectors to generate output and employment. Due to strong assumptions needed to derive multipliers (especially the assumption of Leontief technologies, with fixed prices and no substitution elasticities), the results should be taken with some caution, even if the comparability of the multi-sectoral qualitative analysis and its usefulness is not jeopardised. Results show employment multipliers[6], providing the number of additional jobs per million Birr (ETB 1 million) of additional exogenous demand (and subsequent production) for each group of commodities.

The picture of the Ethiopian economy shows that, under current conditions, livestock activities are those with the highest employment generation capacity (more than 95 jobs per million birr of exogenous demand), followed by cash crops (79.7) and food crops (77.8). The agri-food industry can generate almost 60 jobs, while construction would produce 48 jobs per million birr, compared to 44 jobs for the service sectors. Manufacturing is the lowest labour-intensive sector and would barely reach 15 jobs created per million birr of exogenous demand (Figure 1).

There are larger discrepancies between rural and urban settings (Figure 2). Given the current structure of the Ethiopian economy, agriculture, the food industry and the manufacturing sector have the greatest absorption capacity for job creation in rural areas of the country, as compared to urban and semi-urban areas.

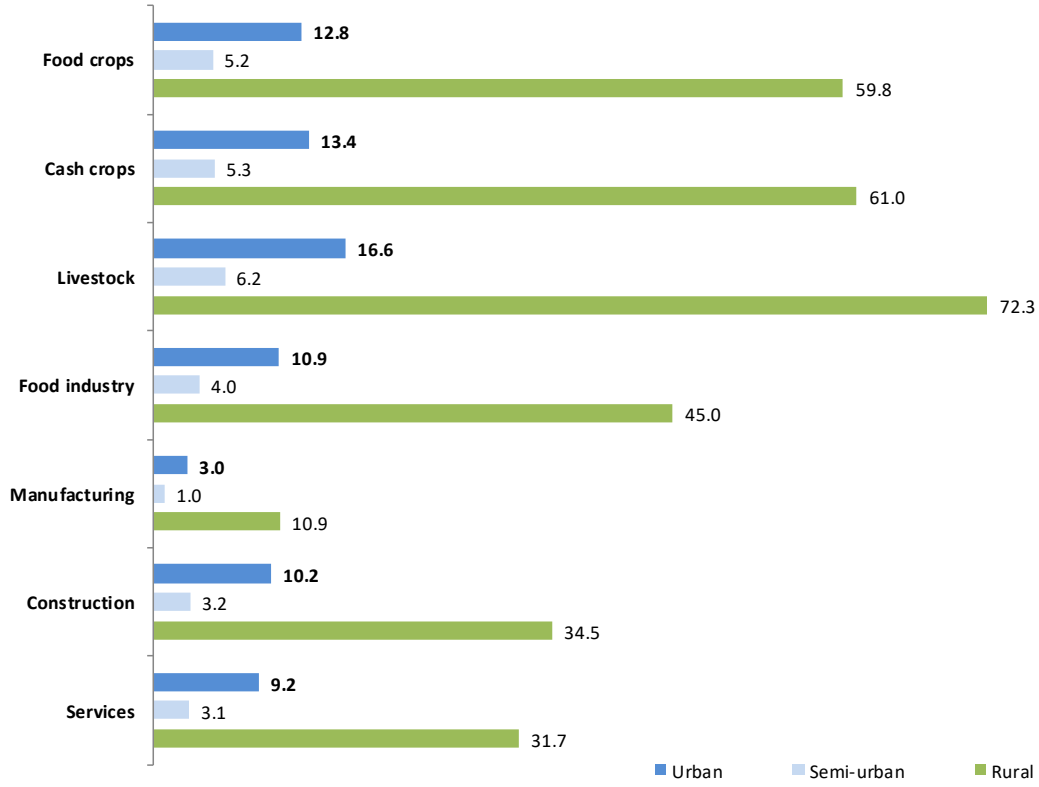
[6] Multipliers are based on the SAM Leontief inverse $\mathbf{M} = (\mathbf{I}-\mathbf{A})^{-1}$, where the matrix **A** is the so-called coefficient matrix (whose elements are the elements of the SAM divided by the total of their corresponding column) and each element m_{ij} in **M** depicts the output requirements of account i to increase the final demand of account j by one unit. These are the output multipliers. Employment multipliers are obtained using a diagonal matrix (**E**) populated with the ratio of the number of jobs per unit of output value[6]. Naming $\mathbf{M_a}$ the submatrix of M forming by the productive accounts rows and the commodities columns, the expression of the employment multiplier, $\mathbf{M_e}$, is $\mathbf{M_e}=\mathbf{E}\,\mathbf{M_a}$. Employment multipliers are obtained using a diagonal matrix (**E**) populated with the ratio of the number of jobs per unit of output value[6]. Naming $\mathbf{M_a}$ the submatrix of **M** forming by the productive accounts rows and the commodities columns, the expression of the employment multiplier, $\mathbf{M_e}$, is $\mathbf{M_e}=\mathbf{E}\,\mathbf{M_a}$.

Figure 1. Employment multipliers in Ethiopia SAM 2015/16



Source Own elaboration

Figure 2. Employment multipliers by rural-urban setting in Ethiopia SAM 2015/16

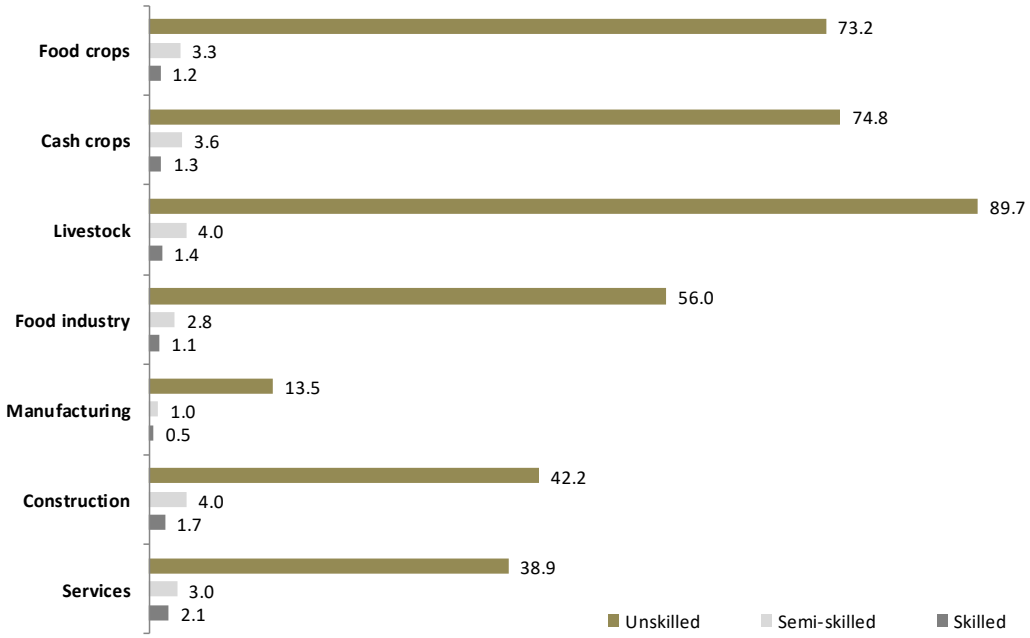


Source Own elaboration

Figures show very low absorption capacity in terms of semi-skilled and skilled workers, while only services show some capacity to attract higher level workers. On the other hand, unskilled workers have the greatest potential, following a very similar pattern in terms of sector rank to the aggregate figure (Figure 3).

Most jobs are created among unskilled workers in rural areas. The regions with the largest unskilled population, i.e. Oromia, Amhara and SNNP[7], would benefit the most in terms of job creation under the current structure (Table 3).

Figure 3. Employment multipliers by labour skill in Ethiopia SAM 2015/16



Source Own elaboration

Table 3. Regional distribution of employment multipliers in Ethiopia SAM 2015/16

	Food crops	Cash crops	Livestock	Food industry	Manuf.	Constr.	Services
Addis Ababa	1.2	1.4	1.3	1.6	0.7	2.5	2.0
Afar	0.6	1.0	1.2	0.8	0.1	0.4	0.4
Amhara	16.8	19.4	26.5	13.7	2.9	10.0	8.6
Benishangul-Gumuz	1.3	1.7	1.2	0.9	0.3	0.9	1.4
Dire Dawa	0.4	0.4	1.1	0.6	0.1	0.5	0.4
Gambella	0.2	0.3	0.9	0.3	0.1	0.2	0.3
Harari	0.1	0.3	0.1	0.1	0.0	0.1	0.1
Oromia	36.4	39.4	44.0	28.0	7.4	21.6	20.3
SNNP	16.1	10.6	10.4	9.3	2.3	8.1	7.3
Somali	0.9	0.9	1.6	0.9	0.2	1.4	0.9
Tigray	3.8	4.4	6.8	3.5	0.7	2.2	2.2
Ethiopia	77.8	79.7	95.1	59.9	14.9	47.9	44.0

Source: Own elaboration

[7] Note that Table 7 provides an overview of employment by region and labour type in 2016.

3.3 The Model: DEMETRA

DEMETRA is an extended version of the single-country CGE model documented in Aragie et al. (2017), based on McDonald (2007). It incorporates a series of additional behavioural relationships to better account for economic relationships in developing countries, in particular in the least developed and sub-Saharan African countries. This version of the model includes several enhanced features compared to its original form. Firstly, it includes a recursive dynamic version, with a new approach to handle domestic migration. In addition, the model accounts for impacts of investments on physical and human capital, an enhanced version of the treatment of demographics, and the inclusion of a completely flexible nested production. For additional details on the modelling techniques, see Boulanger et al. (2018a) and Boulanger et al. (2018b).

The recursive dynamics version accounts for physical capital accumulation due to investments and the demographic evolution of the country (i.e. population and labour force). The demographic profile is influenced by the evolution of human capital (i.e. labour productivity), as birth and death rates are linked to spending on health (reduction of death rate) and education services (reduction of birth rate). Dynamic equations of the model include the increase in irrigated land due to investments in irrigation infrastructure; the increase in labour, fertiliser and seed productivity due to spending on extension services; and the reduction in trade and transportation costs due to investments in roads. The model links different investment types with different capital factors and distinguishes the investments in roads and irrigation from the other type of investments.

The domestic migration flows account for the response of households and labour types to differences in household incomes and wages in different regions. As household incomes and wages increase, more people migrate to that region. The model also includes an exogenous migration share which accounts for the baseline projected rate of urbanisation.

The production side of the model allows for completely flexible constant elasticity of substitution (CES) nesting. In the agricultural sectors, the intermediate inputs are perfectly complementary (i.e. under a Leontief production function). Different labour and capital types are imperfect substitutes, allowing producers to switch to less expensive labour or more productive labour or capital types. Fertilisers are substitutable for land, although with a low elasticity of substitution. Land, labour, capital and intermediate input composites are combined with a CES production at the top nest and hence are all imperfect substitutes. The structure of production in the other sectors is standard: intermediate input composite, labour and capital are imperfect substitutes. However, intermediate inputs are combined in a Leontief nest, i.e. they are perfect complements.

The model includes a detailed description of the public budget dedicated to agriculture, to precisely allocate recurrent (extension, education, health) expenditures, investments (irrigation, road, other) and subsidies (input, labour, capital and other), and to calculate whether or not the commitment under the Malabo Declaration to dedicate 10% of public expenditure to agriculture is achieved.

4 Scenarios

4.1 Scenario development

Generating employment opportunities for rural youth involves creating job possibilities in agricultural and non-agricultural activities. Rural non-farm activities contribute 35-50% of rural income in developing countries (Steven et al., 2010). Households depending on farming are among the poorest. The rural non-farm sector induces economic growth, generates rural employment, and reduces rural poverty (Lanjouw, 2001). For rural youth to benefit from opportunities in the rural non-farm economy, access to connectivity, education and relevant skills training, finance, and legal rights to land are essential socioeconomic conditions. The scenarios simulate, in a schematic but representative way, the existing policy mixes of the Ethiopian government, drawing from the Rural Job Opportunity Creation Strategy (RJOCS) in line with the priorities of the second Growth and Transformation Plan (GTP II) and Climate Resilient Green Economy (CRGE) Strategy. The policy interventions are designed to generate employment opportunities, especially for rural youth. All scenarios are evaluated against a baseline where the Ethiopian economy is projected to 2030, following projections on economic and population growth. The simulations presented in the following sections are not intended to generate precise results for how the economic situation will look. Instead, they may offer policymakers a plausible magnitude of the impact on rural job creation, so that they can choose the best policy mixes to allow achievement of the desired government targets.

Beyond RJOCS and GTP II, the main policy documents and sectoral plans include:

- Agriculture Growth Programme (AGP)
- Livestock Master Plan (LMP)
- Livestock and Fisheries Sector Plan (LFSP)
- Sustainable Land Management Programme (SLMP)
- Productive Safety Net Programme (PSNP)

The GTP II (2016-2020) includes the construction of 15,000 km of rural roads. Overall, this plan doubles road length from 110,000 km in 2014/15 to 220,000 km by 2019/2020. New and safer roads reduce the average time needed to reach the nearest all-weather road from 1.5 hours in 2014/15 to 0.8 hours by 2019/20. Furthermore, areas located further than 5 km from all-weather roads are reduced from 33.6% to 13.5% (NPC, 2016).

The AGP contains strategies and actions designed to increase agricultural productivity for selected crops (see Table 4) in smallholder farms. Measures include scaling up of best agronomic practices, increasing availability and promoting use of fertilisers and improved seeds, and strengthening use of small-scale irrigation by providing access to financing and technical support for rural infrastructure development.

The LMP aims to strengthen investments in livestock development (Shapiro et al, 2015)[8]. The main policy measures include improving productivity of veterinary services, by increasing accesses to veterinary services, market infrastructure, animal fodder and improved varieties. These actions have a positive feedback on rural jobs creation.

The LFSP plan includes policy measures targeting dairy, poultry and fish activities not included in the LMP, considered strategic for food security. Livestock support services institutions are among the primary beneficiaries of the project. Investment interventions through better genetics, feed and health services have the purpose of improving productivity and production of poultry (eggs and chicken meat), red meat and milk activities, crossbred dairy cows and feed activities.

The SLMP belongs to the safety-net programs. The main objective is teaching rural youths of each woreda how to introduce sustainable land and water management practices, to reduce greenhouse gas emissions from land use change, and increase carbon stock sequestration by biomass and organic soil. The job opportunities for rural youths generated by this program come from the public work component.

The PSNP, in its fourth phase, is the most widely used approach to create rural employment in Ethiopia. The Program transfers money to chronically and transitory food insecure households, strengthens livelihoods, and builds community assets through climate smart public works. It covers 8 million chronically poor people in 8

[8] In the case of cow's milk, a future milk surplus could be realised through investment in better genetics, feed and health services, improving traditional dairy farms and commercial-scale specialised dairy production units.

regions and could be extended to cover the remaining regions. It also provides a contingency budget to support local communities in dealing with local shocks and a federal contingency budget to support the food needs on the annual humanitarian appeal. Aside from increasing food security, these policies enhance productive watersheds, rural infrastructures and water retention structures and reduce water run-off, as well as strengthening the capability of local administrators.

From the aforementioned Ethiopian policies, six scenarios[9] are identified (Table 4):

1. Industrial parks and agro-processing industrial parks - Agropark

To develop a more commercial and market-oriented agricultural sector, the government planned to construct agro-industrial parks. Demand for agricultural raw material, rural and skilled labour is positively affected, through forward and backward linkages.

2. Rural roads and other infrastructure development - Road

The construction of new transport infrastructure and the improvement of existing roads in rural areas increase input accessibility and reduce trade margins, with a positive impact on productivity and efficiency, in agriculture and in other up- and downstream sectors. Lower trade margins reduce the prices of goods and services, stimulating demand for agricultural goods and rural labour.

3. Irrigation

GTP II gives prime attention to the production of commercial agricultural crops through large and small irrigation schemes. Investments in new irrigation infrastructure stimulate demand for semi-skilled labour and intermediate inputs in construction activities, while the rise in crop production increases demand for rural labour.

4. Provision of extension services for livestock - Livestock

Public spending on extension services, e.g. measures to increase agricultural productivity of crops and livestock activities, creates employment opportunities for rural youth.

5. Productive Safety Net Programme (PSNP) – Labour subsidy

This programme aims to contribute to the sustainable development of the Ethiopian economy by building community assets through climate-smart public works. The creation of new employment opportunities in rural areas (participation in labour-based public works) is supported by subsidising the employment of unskilled and semi-skilled labour.

6. Rural skills enhancement – Skills

Increasing public spending on social services, education and training in rural areas helps less qualified labour not only to increase the productivity and profitability of agricultural activities, but also to engage in off-farm activities. Promoting Agricultural Technical Vocational Education and Training (ATVET) increases labour productivity and labour force participation, generating employment opportunities.

[9] Two additional scenarios have been simulated. To simplify the presentation of scenarios and results, they are discussed in Annex 2.

Table 4. Description of scenarios

Type of the scenario	How to create employment: demand side	How to create employment: supply side	Targeted sectors and activities
1. Agropark	- increases demand for agricultural goods and intermediate inputs - increases demand for labour by promoting other sectors (e.g. constructions. agriculture)	- increases productivity and competiveness of agri-food sector	- agro-processing industrial park - agricultural activities - construction
2. Road	- spending on public infrastructure	- decrease of trade and transportation margins and increase on competiveness of goods.	- rural road (construction) - agricultural activities (higher productivity)
3. Irrigation	- spending on public infrastructure - increase demand in construction sector	- increases productivity and competiveness of agricultural land	- agricultural activities - construction
4. Livestock	- spending on public goods (extensions)	- increases labour/capital and inputs productivity	- main cereals[10] (teff, wheat, maize, barley, sorghum) chickpea, faba bean fruit (banana, mango), vegetables (tomato, potato, onion) spices - livestock, camel development, pig farming, apiculture, silk production, animal feed, hides and skins[11]
5. Labour subsidies		- generates employment opportunities by engaging them in provision of climate smart activities	- agricultural activities
6. Skill	- spending on rural education and training	- Enhance youths' skill and widen up their employability in off farm activities	- wood and metal workshops, tailoring and sewing, weaving and pottery making

Source: Own elaboration

[10] It is indicated in AGP I and II

[11] These are specified in LMP and LFSP

4.2 Scenario assumptions

In 2009, Ethiopia signed the Comprehensive Africa Agriculture Development Programme (CAADP), whose main target is achieving 6% annual growth in agricultural gross domestic product (GDP). It is recognised that enhanced agricultural performance is crucial to increase employment opportunities, especially for weaker economic agents (women and youth). All the scenarios assume that the government devotes 10% of its spending to agricultural and rural related activities.[12] To identify the best policy direction for the scenarios listed above, each simulation assumes that the whole budget increase compared to the baseline needed to reach 10% is devoted to a single measure (Table 5), although some of the scenarios are complementary and belong to the same policy umbrella. For instance, the provision of skills training cannot generate employment opportunities to rural youth unless it is accompanied by capital investments and expansion of employment opportunities in other sectors. Nonetheless, a single-policy simulation is useful to show policymakers the impacts of the shock in isolation, and to highlight the inevitable trade-offs between different public expenditure decisions.

Table 5. Agricultural public expenditure by scenario (billion ETB, 2030)

	Base 2016	Base 2030	Agropark	Road	Irrigation	Livestock	Labour Subsidy	Skill
Agricultural Budget	**11.51**	**21.29**	**54.96**	**54.6**	**53.81**	**51.7**	**48.1**	**52.12**
Investment	**4.15**	**8.18**	**41.85**	**41.49**	**40.87**	**8.2**	**8.19**	**8.18**
Rural road	3.09	6.09	6.04	39.45	5.96	6.10	6.09	6.08
Irrigation	1.06	2.09	2.05	2.04	34.92	2.09	2.09	2.09
Agropark	0.00	0.00	33.76	0.00	0.00	0.00	0.00	0.00
Recurrent expenses	**3.20**	**8.95**	**8.96**	**8.95**	**8.78**	**39.35**	**7.81**	**39.78**
Extension	2.60	6.24	6.33	6.22	6.15	36.77	5.49	5.58
Rural Education	0.31	0.82	0.83	0.82	0.81	0.81	0.75	32.67
Rural Health	0.30	1.89	1.80	1.91	1.82	1.77	1.57	1.53
Output Subsidy	**4.16**	**4.16**	**4.16**	**4.16**	**4.16**	**4.16**	**4.16**	**4.16**
Input subsidy	**-**	**-**	**-**	**-**	**-**	**-**	**27.94**	**-**
Ag Budget Share	**5**	**4**	**10**	**10**	**10**	**10**	**10**	**10**

Source: Model results

When the government increases a given recurrent public expenditure (e.g. on livestock extension or skills enhancement), all the other expenditures are reduced proportionally to keep the government savings fixed as a given share of GDP. When the simulation is an increase in government investment (i.e. capital expenditures such as investments in irrigation or roads), the simulated government savings are increased, via a reduction in public expenditure, to finance the new investments. Government savings are kept as a constant share of GDP. If a policy shock increases GDP, it gives the government policy the possibility to spend more money. The possible paths and mechanics through which the simulation affects the Ethiopian economy are extensively explained in the next section.

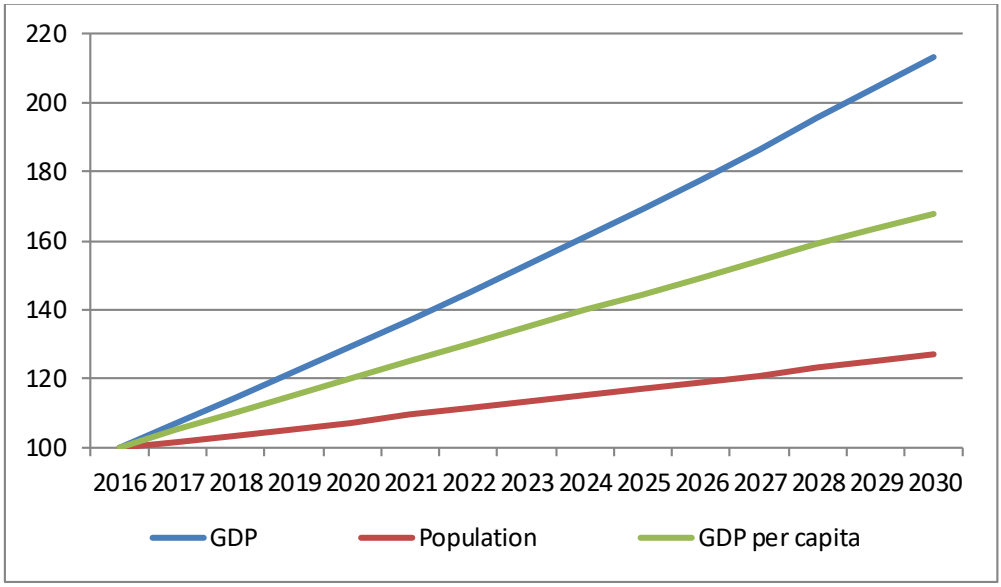
4.3 Scenario descriptions

4.3.1 Baseline

The baseline is calibrated by exogenously imposing the two main macroeconomic developments in the model, which are GDP and population. Projections are obtained from FAO (2018). Annually, GDP and population grow, on average, by 5.6% and 1.8% respectively, corresponding to 66.9% and 27.7% over the whole period. By 2030, GDP is almost 2.2 times larger than in 2016, whilst population increases by only 1.3 times, suggesting that the major driver in per capita GDP growth is the GDP (Figure 4).

[12] Note that Ethiopia already meets the Maputo target of spending 10% of budgetary resources on agricultural and rural development. In this study, agricultural budget refers to agriculture-specific expenditures as defined by the Monitoring and Analysing Food and Agricultural Policies (MAFAP) database.

Figure 4. GDP, GDP per capita and population index, baseline, 2016=100



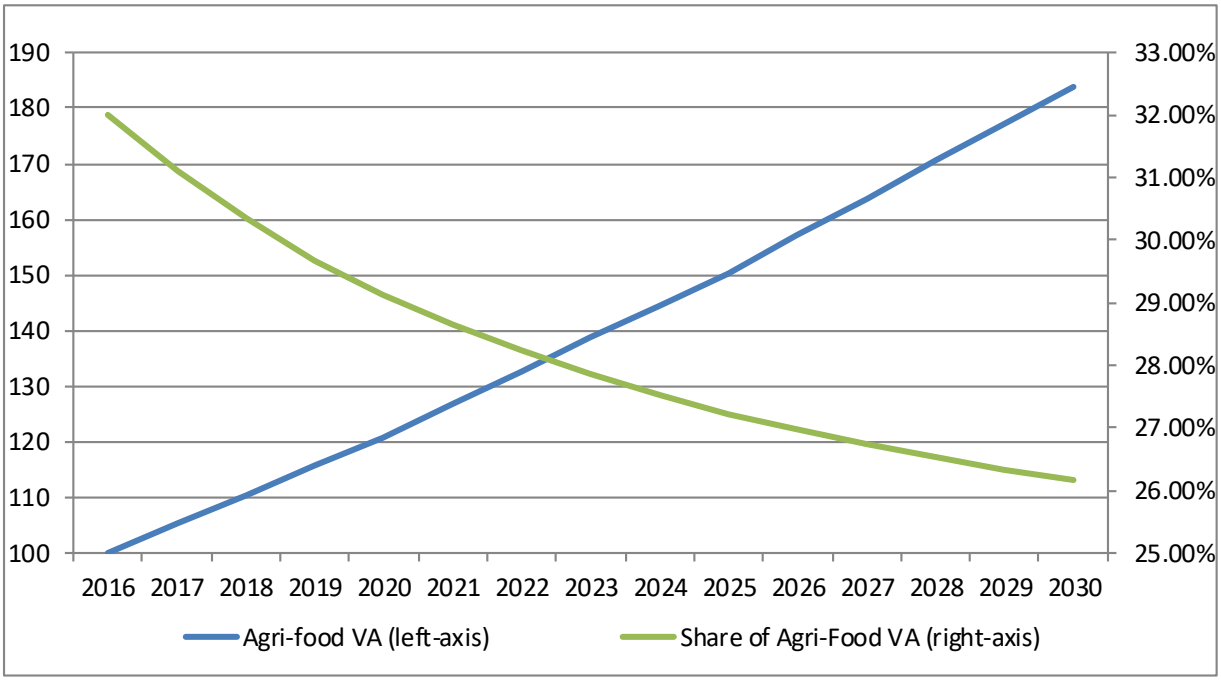
Source FAO (2018), own elaboration

In the scenarios, GDP becomes endogenous while a productivity parameter (namely the shift parameter on CES functions for value added) employed to calibrate GDP becomes exogenous. That is, the change in the productivity parameter of the model is imposed exogenously to replicate the GDP growth in the baseline. Thus, any difference from baseline in GDP in the scenarios is due to the simulated policy change (see below for results on evolution of GDP and GDP per capita).

In addition, in the baseline, investment is fixed and follows the GDP rate of growth (while savings are adjusted endogenously). At the same time, government savings (calculated as government income minus government expenditure) and current account balance (calculated as imports minus exports minus net transfers from the rest of the world to the country being analysed) are kept as a fixed share of GDP. Given the dynamic of the Ethiopian GDP in the baseline, government deficit and current account balance increase in nominal terms but preserve a constant ratio with GDP.

The agri-food value added (Figure 5) follows the GDP growth trend. However, its share of value added declines from 32% to 26%. This significant decrease is also due to the flow of people migrating from rural to urban areas, driven by income differentials.

Figure 5. Agri-food value added (left-hand scale) and its share in value added (right-hand scale), baseline, 2016=100



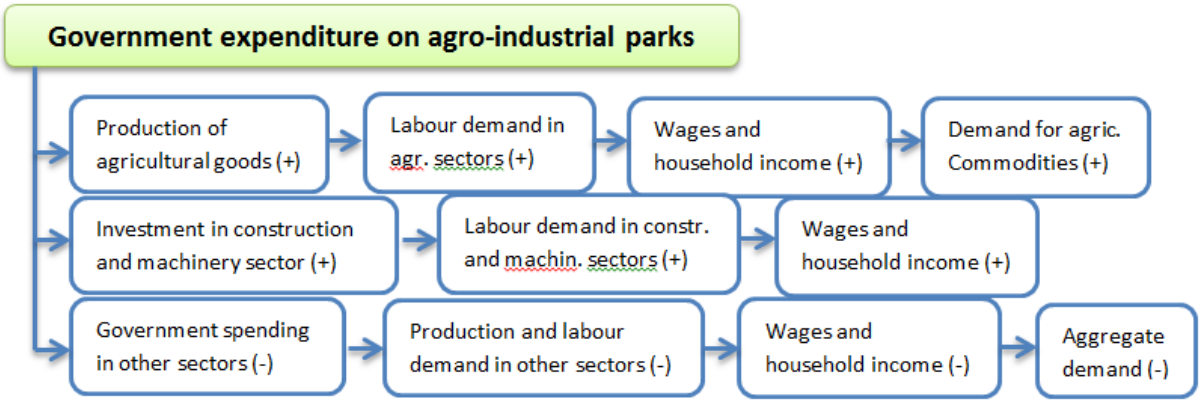
Source Model results

4.3.2 Industrial parks and agro-processing industrial parks - *Agropark*

The development of agro-industrial zones aims to accelerate the structural transformation of agriculture, by supporting commercialisation through permanent rural-urban linkages.

In the model simulation, the increase in the public budget is invested in an initially very small sector called 'agropark' (latent sector approach). This sector produces a commodity which is exclusively exported. Investments affect construction and machinery production. The demand for selected agricultural products used as input by the processing industries increases, with positive consequences on rural employment opportunities, especially for unskilled labour. Positive ripple effects are expected on downstream sectors (e.g. manufacturing, transport services, intermediate inputs). However, by assumption, the agropark investments require public resources to be reallocated from other sectors. Due to disposing of fewer resources to employ in their economic activities, their performance should contract. For this reason, the direction and the magnitude of impacts on household income, employment and domestic demand is uncertain, depending on which economic forces prevail (i.e. positive impacts on production and aggregate demand generated by the resources invested in agroparks, versus negative impacts created by the proportional reduction in resources for the remaining economic activities). This holds for all scenarios presented in this report. Figure 6 presents a simple sketch of the main variables affected by this policy scenario.

Figure 6. Main variables affected by the Agropark scenario



Source Own depiction.

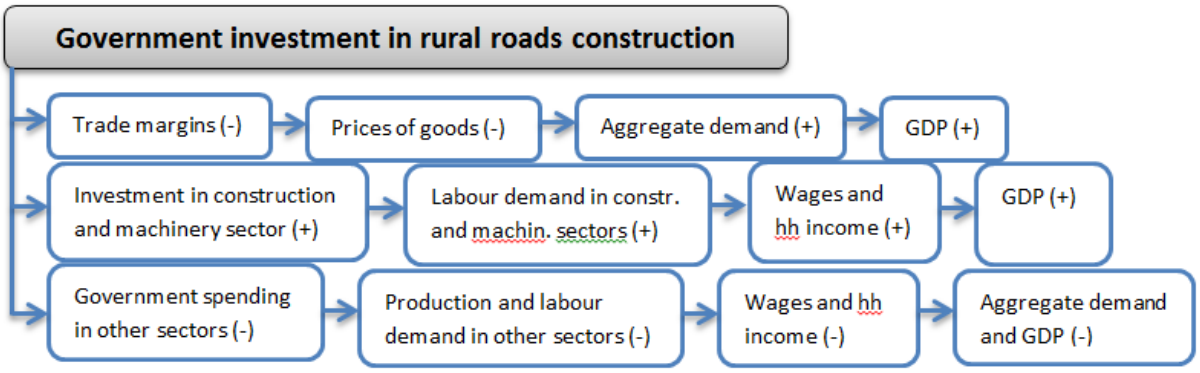
4.3.3 Rural roads and other infrastructure development - *Road*

Investment in rural road development lowers the cost of bringing products to the market for all agri-food sectors, and raises accessibility to agricultural inputs for smallholder farmers, with positive repercussions on productivity and rural labour demand. For example, the time saved to reach the working site may be allocated to other (economic, agricultural and non-agricultural) activities. Furthermore, the construction of new roads pushes demand for labour in other related labour-intensive sectors of the economy, such as construction, transportation services and light manufacturing.

The model includes feedback from changes in investment in rural roads to changes in marketing margins. An estimate on the link between rural infrastructure and marketing margin for African countries shows elasticities of 0.19 for the agricultural sector and 0.15 for the non-agricultural sector (Schürenberg-Frosch, 2014). These values were used to derive the reduction in trade and transport margins in the agricultural and non-agricultural sectors, respectively. The simulation provides information on which sectors and regions would benefit most from improvements to road infrastructure.

As in the previous scenario, investing in rural roads has a direct expansionary and an indirect contractionary impact (Figure 7). The allocation of public resources to the construction sector increases demand for intermediate inputs associated with this activity, which in turn has a second-order expansionary impact through lower prices, increased labour demand and household income. The need to finance these investments, however, implies a reduction in resources devoted to other sectors, generating a negative impact on aggregate demand, labour and household income.

Figure 7. Main variables affected by the Road scenario



Source Own depiction.

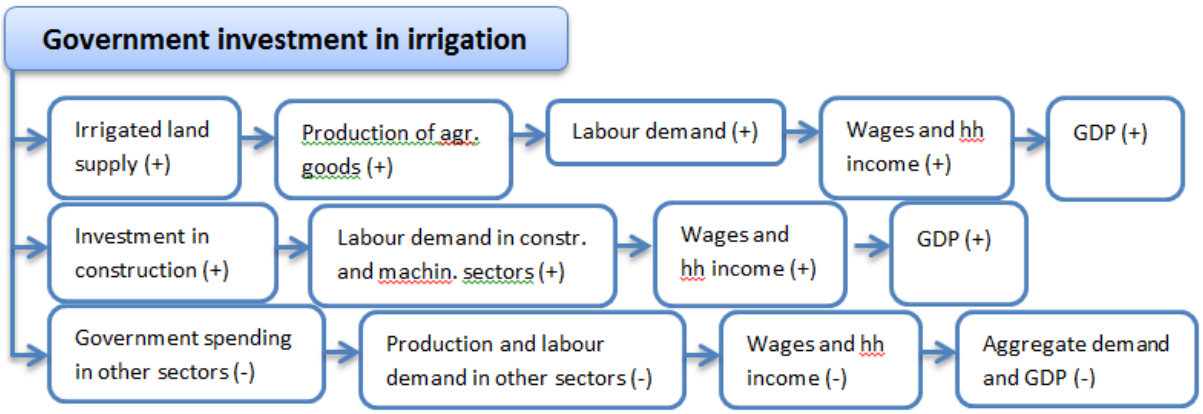
4.3.4 Irrigation

Ethiopia covers 112 million hectares (mha) of land. Estimates of arable land area vary between 30 mha and 70 mha. Currently, only around 15 mha of land is under cultivation, of which about 0.4-0.5% is irrigated. Ethiopia's surface water, groundwater, and rainwater resources cover at least 5.3 mha of irrigation potential. One sixth of the country's arable land could be irrigated with existing water resources. This includes 3.7 mha from gravity-fed surface water, 1.1 mha from groundwater and 0.5 mha from rainwater harvesting (Awulachew, 2010).

With such a low share of irrigated land, irrigation and rain-fed agriculture are not interchangeable. If they were, farmers could use their agricultural land to produce irrigated crops during the dry season. Irrigation can allow smallholders to harvest twice per year, with positive effects on productivity and rural labour employment. For this reason, the government has allocated ETB 28 billion over the next five years to develop irrigation and other water-related facilities in rural areas (NPC, 2016). A key element which needs to be addressed is land ownership. This is because no farmer will make long-term investments in irrigation if land rights are uncertain.

In the model simulation, investment spending in irrigation infrastructure translates into an increase in the supply of land. Production, as well as labour demand, in agriculture and the construction sector increase, with positive effects on household income and aggregate demand, especially in rural areas. Investment in irrigation is financed through a reduction in other recurrent government expenditure, negatively affecting the economic performance of other sectors (Figure 8).

Figure 8. Main variables affected by the Irrigation scenario



Source: Own depiction.

4.3.5 Extension services in rural areas for livestock activities - *Livestock*

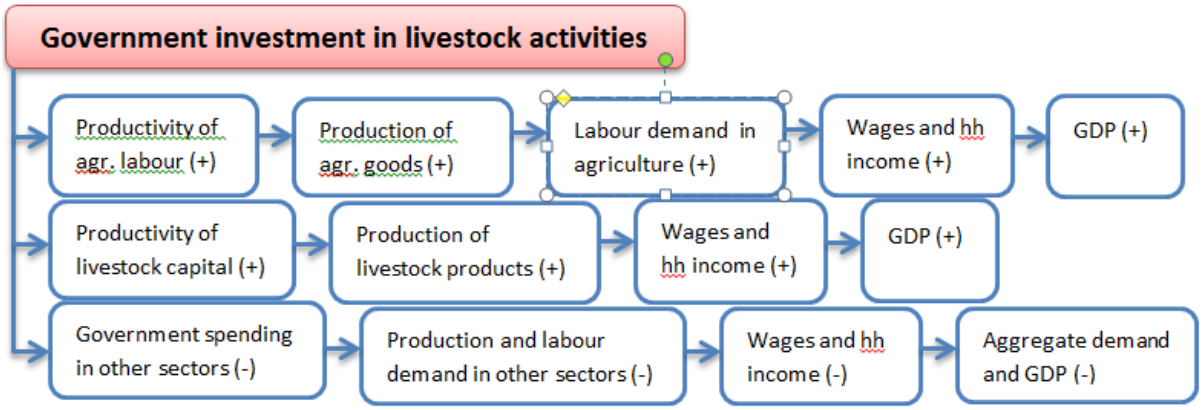
Under the LMP, ETB 7,762 million (USD 388.1 million) is invested in the agro-livestock sector: 57% from the public sector and 43% from the private sector. The increased productivity for high value commodities – such as livestock products (skins and hides, leather, live animals and meat) but also pulses, textiles, natural gum and mineral products – benefits smallholder farmers, increases participation of women and youth in rural economic activity, and improves household diet variety. This is reducing poverty (for approximately 2.36 million livestock-keeping households) and helping family farms to move from traditional to improved market-oriented systems.

The increased government expenditure on extension services affects the productivity of labour employed in agriculture and livestock, and rural capital invested in the livestock sector (Figure 9). Agricultural and livestock production increases, as well as labour demand, wages and household demand, with positive effects on domestic demand. However, lower public expenditure on other sectors reduces the demand for labour in these sectors and may decrease the demand for labour in rural areas. As for the other scenarios, the impact on employment, wages, household income and aggregate demand is uncertain.

One should also highlight that few rural farming communities in the country practice modern livestock breeding activities, which needs to be scaled up. However, besides space and potable water, this requires

substantial initial capital. Lack of rural credit facilities, especially for rural youth, is a critical challenge to engaging in modern livestock breeding.

Figure 9. Main variables affected by the Livestock scenario

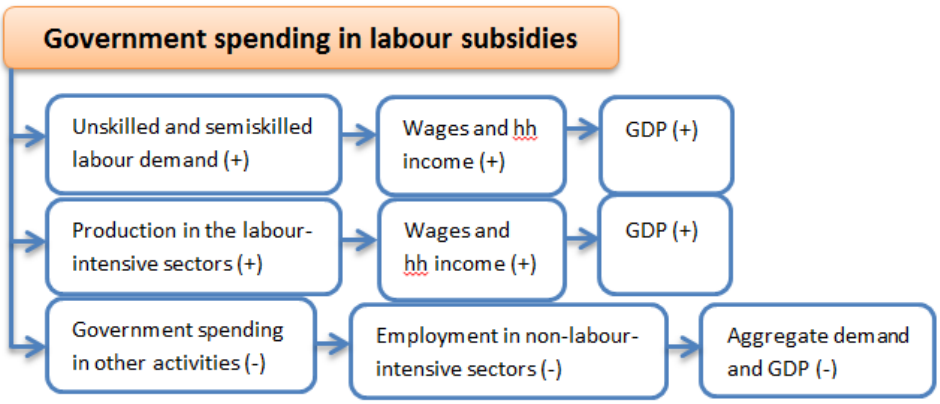


Source Own depiction.

4.3.6 Productive Safety Net Programme (PSNP) – *Labour subsidy*

To model the impact of expenditure on safety net programmes, the increase in government agricultural budget is devoted to subsidising the less skilled labour types (unskilled and semi-skilled), irrespective of the sectors in which they are employed. This measure reduces the cost of hiring unskilled and semi-skilled labour in all rural regions. Public expenditure in other sectors is proportionally reduced; thus production in less labour-intensive sectors falls. This negatively affects household income and aggregate demand, and the net effect on the creation of new jobs in rural areas highly depends on which economic force prevails (Figure 10).

Figure 10. Main variables affected by the Labour subsidy scenario



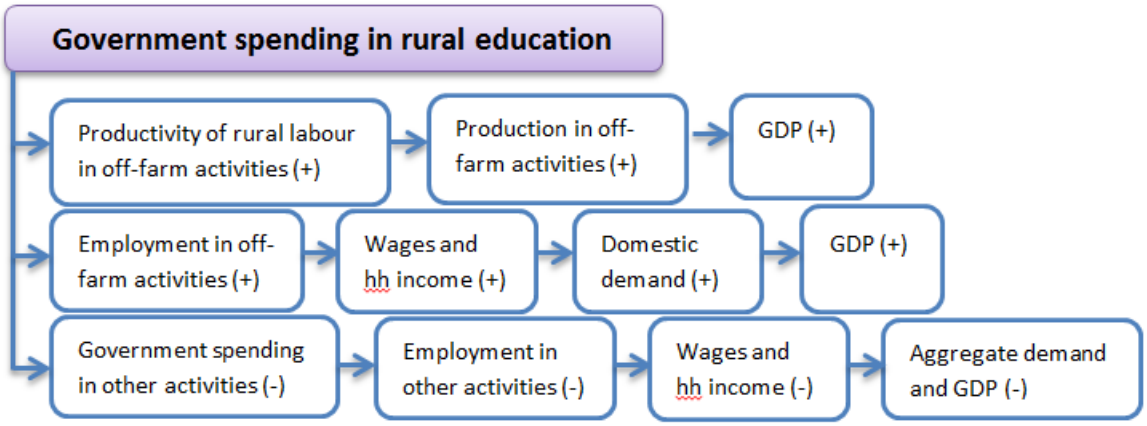
Source Own depiction.

4.3.7 Rural education and skills enhancement - *Skills*

Most of the unemployed youth in rural areas are early school leavers with no skills, with a very low degree of employability outside the rural context. Basic skills, such as carpentry and masonry, are essential to enable rural youth to secure a job, engage in off-farm income activities, or exploit self-employment opportunities in other sectors. Measures to enhance the labour skills of rural youth include: provision of knowledge and skills building, business training and service development; support for programmes focusing on youth and women; integrated support for citizens engaging in various rural job opportunity creation schemes as individuals, groups, cooperatives, mid-size enterprises and others; and expansion of job opportunities through evidence-based contextual analyses.

Greater job opportunities in off-farm activities increase demand for labour, whilst demand for other production factors decreases, both positively and negatively affecting household income. The net effect depends on the relative importance of these two opposite effects. Furthermore, the change in household income entails variations in demand for goods and services, which in turn affects demand for labour. The simulation reallocates a share of the public budget to rural training and education services (enhancing productivity of rural labour), proportionally reducing government spending on other sectors, where production and labour demand are negatively affected. Hence, the net effect on the creation of new jobs in rural areas highly depends on which economic force prevails (Figure 11).

Figure 11. Main variables affected by the Skills scenario



Source: Own depiction.

5 Results

Most of the results presented in this section refer to the year 2030, and are expressed as percentage change with respect to the baseline scenario for the same year. Therefore, numbers indicate by how much the indicator varies in response to the application of a policy scenario in that year.

5.1 Job, income and migration

All policy scenarios have minor impacts on employment by production factor (Table 6). This is mainly due to the structure of the model and to availability of data. According to data extracted from the International Labour Organization (ILO) household budget survey, unemployment in Ethiopia is relatively low (on average around 10%, excluding higher figures for Addis Ababa where average unemployment is more than 25%). Given the exogenous growth in GDP and population growth, unemployment is fully absorbed during the baseline period in all regions but the capital city. This means that the potential to create additional jobs compared to the baseline is limited to the movement of workers among sectors and regions, but within an almost zero-sum game. The data (in particularly related to own production and informal workers) and model do not fully capture the phenomenon of underemployment, so although the impact on job creation presented gives indications of the impact of policies on the labour market, figures should be treated with some caution.

Under these conditions, labour employment grows most under the labour subsidy scenario as this policy stimulates demand for labour, especially rural labour. On the other hand, the increase in skills under the skills scenario makes workers more productive, reducing the number of workers needed to produce the same amount of output.

The impacts on capital employment are however more diversified. The agropark scenario increases the demand for capital the most (3.15%), given the boost to the development of capital-intensive sectors. However, other scenarios seem to dampen demand for capital, and this is likely due to the substitution effect at play between the three primary production factors and the production factor intensity of the sector affected by the policy scenario. The only impact envisaged for land is under the irrigation scenario (0.13%).

Table 6. Employment by production factor (% change from base, 2030)

	Baseline 2016	Baseline 2030	Agropark	Road	Irrigation	Livestock	Labour Subsidy	Skill
Labour	101,674	129,181	-0.02	0.00	0.00	0.00	0.03	-1.64
Skilled	4,663	4,532	-0.01	-0.03	-0.17	0.07	0.12	-0.27
Semi-skilled	7,534	8,618	1.19	0.03	-0.04	-0.28	0.94	-0.99
Unskilled	89,480	116,052	-0.11	0.00	0.01	0.01	-0.04	-1.74
Land	13,931,790	13,933,354			0.13			
Non-Irrigated	13,743,016	13,743,016						
Irrigated	188,774	190,332			0.83			
Capital	549,685	3,491,689	3.15	0.11	-2.34	-0.71	-0.04	0.00

Source: Model results

NB: Labour and land for baseline 2016 and 2030 values are expressed in physical units (millions of worked hours and hectares, respectively). Capital baseline values are in billion ETB.

Focusing on labour employment by type and location (Table 7), the less qualified labour types (unskilled and semi-skilled) are more favoured under the labour subsidy scenario. Changes in Addis Ababa, which is experiencing some moderate decreases under many scenarios, particularly under unskilled labour, are mainly due to a decrease in the movement of workers towards the capital city compared to the baseline, and thus a reduction in the urbanisation growth rate (Figure 15). The agropark scenario increases demand for labour, especially the semi-skilled type. Apart from some negligible negative impacts, unskilled labour turns out to be the labour type benefiting the most from the simulated policies. This result is positive for the Ethiopian economy, where unskilled labour accounts for about 90% of the labour force. Indeed, to better understand the real magnitude of the policy impacts, it is important to interpret the percentage changes together with absolute baseline values.

Table 7. Employment by region and labour type (% change from base, 2030)

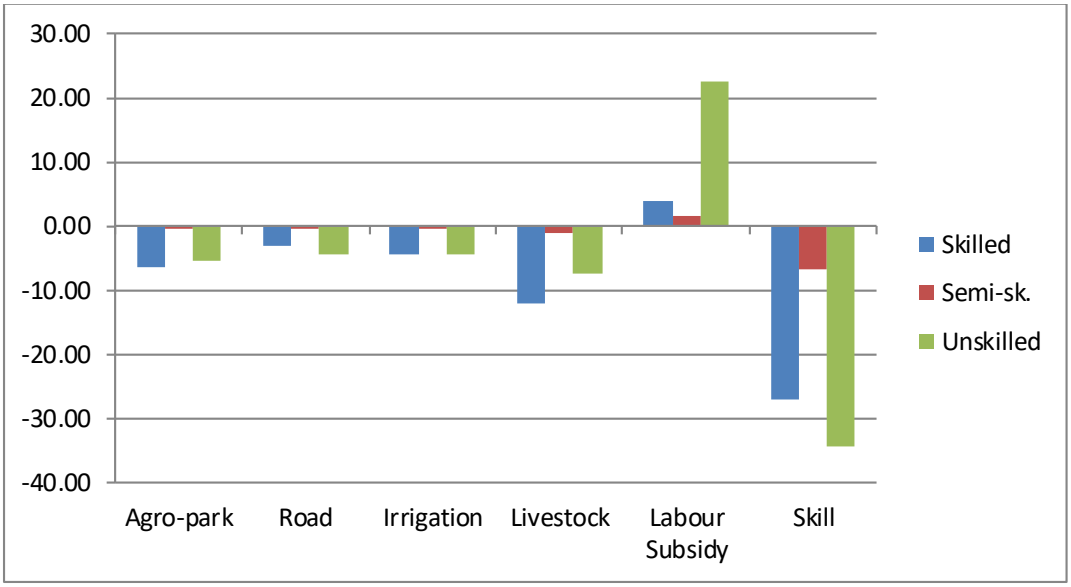
	Base 2016	Base 2030	Agropark	Road	Irrigation	Livestock	Labour Subsidy	Skills
Skilled	4,663	4,532	-0.01	-0.03	-0.17	0.07	0.12	-0.27
Addis Ababa	1,506	1,670	-0.01	0.00	0.00	0.01	0.00	-0.01
Afar	63	55	0.48	-0.40	-0.40	0.27	-1.92	0.46
Amhara	533	419	1.06	-0.10	-0.31	0.45	-0.18	-2.59
Benishangul-Gumuz	40	51	0.00	0.00	0.00	0.02	0.02	-2.33
Dire Dawa	27	21	-1.05	-0.53	-0.43	0.72	-1.82	-2.53
Gambella	40	40	-1.15	-0.10	-0.13	0.38	-0.65	-3.34
Harari	13	9	-5.36	-0.80	-0.80	0.57	-2.62	-4.10
Oromia	1,277	1,240	-0.36	-0.20	-0.42	-0.30	0.00	0.90
SNNP	957	845	0.05	0.21	-0.03	0.33	1.06	-0.45
Somali	74	57	-3.67	-0.44	-0.03	0.03	-0.75	-1.36
Tigray	133	125	1.99	0.24	-0.26	1.31	-0.22	-3.55
Semi-skilled	7,534	8,619	1.19	0.03	-0.04	-0.28	0.94	-0.99
Addis Ababa	846	1,856	-0.03	0.08	0.40	-0.15	-0.26	-0.77
Afar	115	104	3.56	0.39	0.06	0.30	0.23	-2.10
Amhara	1,220	1,204	2.70	0.08	-0.10	-0.02	2.06	-1.66
Benishangul-Gumuz	100	128	0.00	-0.01	0.00	0.01	0.02	-2.28
Dire Dawa	261	192	0.10	-0.29	0.09	-0.65	-0.31	-2.34
Gambella	72	55	-1.63	0.15	0.09	-0.51	-0.35	-1.90
Harari	42	31	-1.89	-0.03	-0.10	-1.09	-0.22	-2.95
Oromia	3,152	3,328	0.68	-0.05	-0.30	-0.51	1.16	-0.70
SNNP	952	962	2.81	0.21	0.00	-0.33	1.63	-0.57
Somali	267	243	0.69	-0.23	0.24	-0.05	-0.81	-2.89
Tigray	507	516	3.26	0.05	-0.05	0.18	1.77	-0.69
Unskilled	89,480	116,053	-0.11	0.00	0.01	0.01	-0.04	-1.74
Addis Ababa	2,852	4,647	-2.21	-0.02	0.22	0.44	-1.74	-0.43
Afar	1,031	1,110	0.04	0.00	0.00	0.01	0.00	-0.87
Amhara	19,434	23,851	0.00	0.00	0.00	0.00	0.04	-1.52
Benishangul-Gumuz	1,926	2,470	-0.01	0.00	0.01	0.01	0.03	-2.41
Dire Dawa	833	1,041	0.01	0.00	0.01	0.01	0.09	-0.96
Gambella	437	481	-0.01	0.00	0.00	0.00	0.02	-1.24
Harari	201	256	-0.02	0.00	0.00	0.00	0.08	-1.30
Oromia	41,349	55,067	-0.03	0.00	0.00	-0.01	0.04	-1.98
SNNP	14,566	18,678	-0.02	-0.01	0.00	0.00	0.03	-1.84
Somali	2,186	2,318	0.00	0.00	0.00	0.00	0.01	-0.81
Tigray	4,665	6,135	-0.01	0.00	0.00	0.01	0.02	-1.48

Source: Model results

NB: Values in base 2016 and 2030 are expressed in millions of worked hours.

All policy scenarios except labour subsidy manage to reduce unemployment in the Addis Ababa region (Figure 12). In particular, the skills scenario, which has the advantage of increasing labour productivity, makes labour more attractive and increases wages. The effect on the Addis Ababa labour market is due to a decrease in the rate of workers moving to Addis Ababa from other regions. For instance, under the agropark scenario, the number of unskilled workers moving to Addis Ababa is reduced by 10% compared to the baseline, reducing the pressure on the capital city labour market.

Figure 12. Addis Ababa unemployment by labour type (% change from base, 2030)



Source Model results

Wage rates (i.e. returns on labour) increase under those scenarios that directly boost labour productivity, such as the skills scenario which has a positive income on wages for all labour types. In other words, this means creating 'better' jobs for Ethiopian workers. Other scenarios, such as agropark, increase demand and consequently salary for unskilled labour. Under the labour subsidy scenario, only wages for unskilled labour are favoured, in a very similar way throughout the country (Table 8). On the other hand, the labour subsidy scenario shows again that, despite being able to raise salaries (and employment) for unskilled workers in some regions, the overall effect for the economy is negative, as it introduces a significant distortion to the system. It should be accompanied by other policy measures to avoid possible losses.

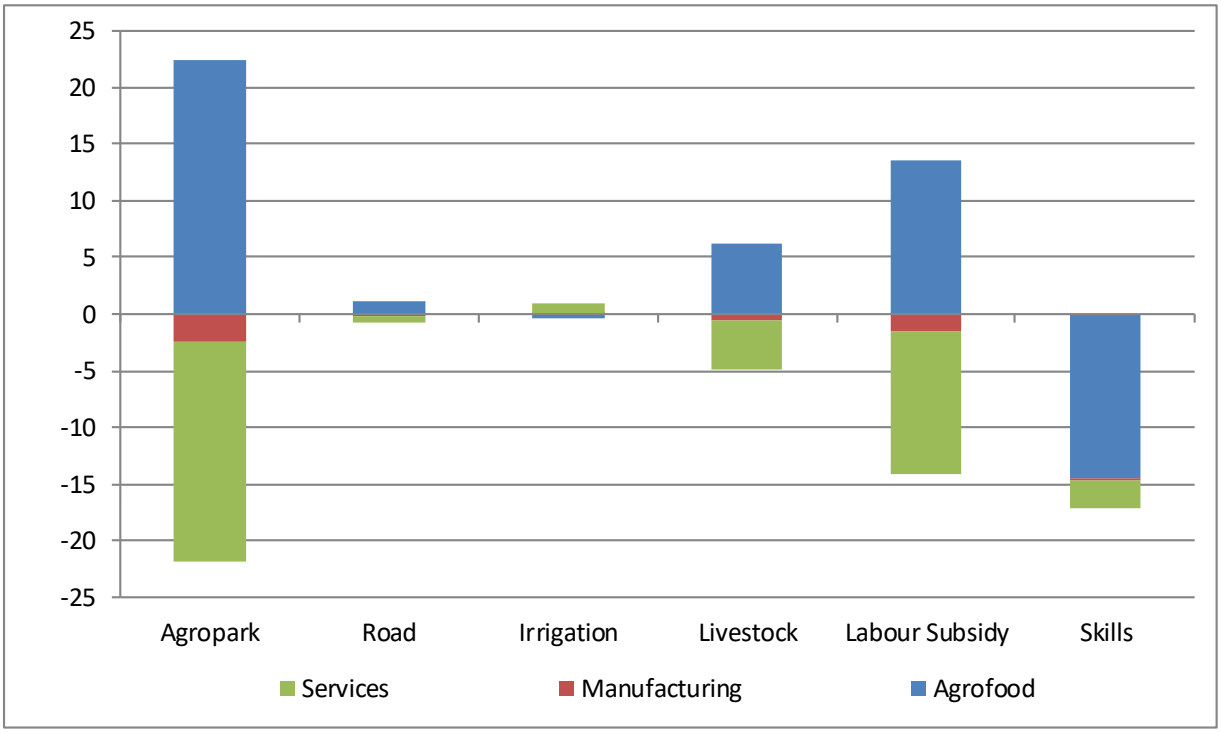
Table 8. Wage rate by region and labour type (% change from base, 2030)

	Agropark	Road	Irrigation	Livestock	Labour Subsidy	Skills
Skilled	-0.66	0.76	0.42	1.02	-3.30	6.51
Afar	0.38	0.47	0.31	1.37	-2.60	6.45
Amhara	1.96	0.67	0.53	1.31	-2.50	6.83
Benishangul-Gumuz	2.28	0.94	0.29	2.38	-2.36	8.43
Dire Dawa	1.85	0.78	0.50	1.54	-2.13	6.59
Gambella	1.13	0.60	0.40	1.59	-2.18	5.39
Harari	2.42	0.86	0.61	1.46	-2.03	6.58
Oromia	0.82	0.62	0.31	1.31	-2.56	5.95
SNNP	-0.68	0.66	0.35	1.03	-2.40	6.73
Somali	3.66	0.76	0.58	2.14	-1.00	7.67
Tigray	2.38	0.59	0.47	1.22	-2.46	6.72
Semi-skilled	0.72	0.68	0.47	1.24	-1.51	6.05
Afar	2.70	0.91	0.79	1.89	0.17	5.56
Amhara	1.60	0.72	0.54	1.95	0.38	6.63
Benishangul-Gumuz	2.39	0.86	0.77	1.41	1.13	8.77
Dire Dawa	-0.59	0.60	0.52	1.46	-1.12	6.71
Gambella	3.21	0.81	0.69	1.79	0.13	5.76
Harari	1.67	0.80	0.79	1.71	-0.79	6.37
Oromia	-0.18	0.59	0.42	1.76	-0.36	5.81
SNNP	0.37	0.68	0.44	1.76	-0.16	6.29
Somali	2.35	0.41	0.82	1.83	-0.64	6.21
Tigray	0.79	0.66	0.56	1.59	-0.35	6.37
Unskilled	4.51	0.75	0.30	1.91	1.71	6.80
Afar	5.31	0.96	0.62	2.63	2.41	6.64
Amhara	3.29	0.65	0.21	2.34	2.98	7.07
Benishangul-Gumuz	1.05	0.57	0.08	1.78	1.56	10.24
Dire Dawa	2.64	0.50	0.60	2.90	2.40	5.87
Gambella	1.91	0.42	-0.13	2.04	2.00	6.70
Harari	1.52	0.76	0.33	2.64	2.38	5.90
Oromia	3.62	0.79	0.25	2.23	2.72	7.02
SNNP	4.00	0.73	0.20	2.32	2.69	7.20
Somali	0.50	0.58	0.46	2.32	1.23	6.45
Tigray	3.66	0.66	0.20	2.48	3.13	7.29

Source: Model results

Figure 13 shows how the Ethiopian labour market is reshaped by the policy scenarios. They firstly create the conditions to favour development of the agri-food sector labour market, absorbing more workers than in the baseline. Labour demand in agriculture and the food industry increases, moving away from the other sectors of the economy, except in the skills scenario, where all employment is reduced but better jobs are created as explained above. Agropark (2.26%), livestock (0.64%) and labour subsidy (1.36%) show the capacity of the agri-food sector to absorb workers thanks to specific policy shocks focused on this objective (Table 9).

Figure 13. Labour employment by macro-sector (change from base, 2030)



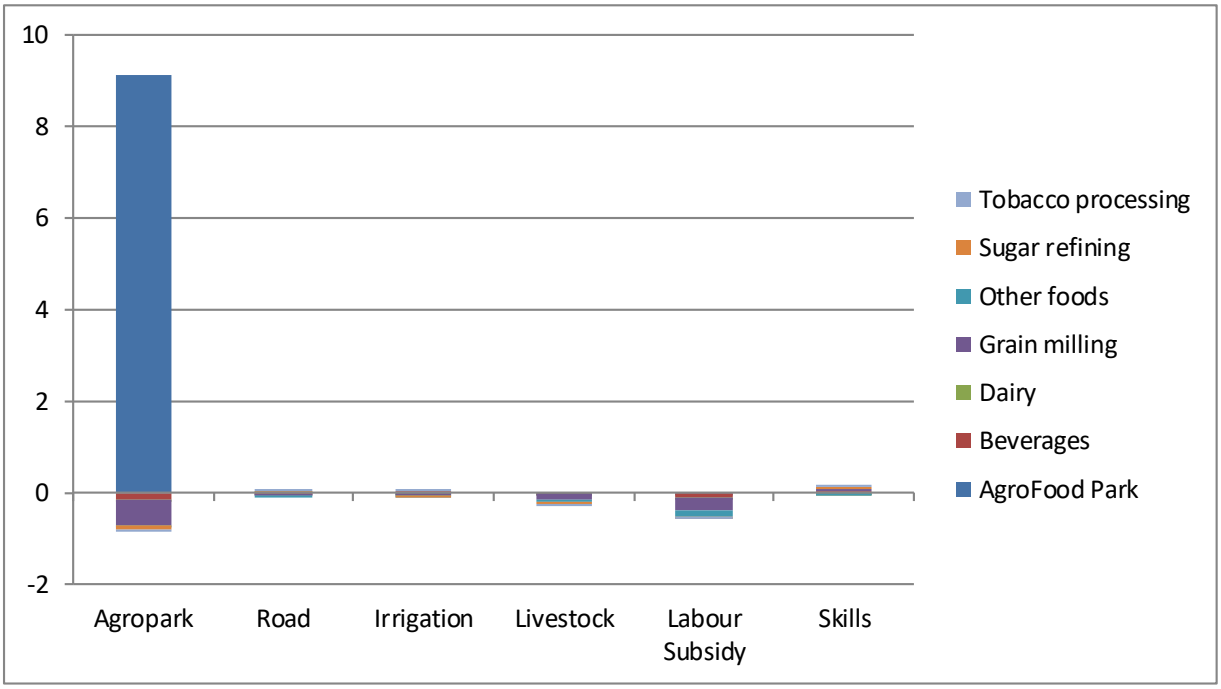
Source: Model results
NB: Values are expressed in millions of worked hours

Table 9. Agri-food employment by labour type (% change from base, 2030)

	Agropark	Road	Irrigation	Livestock	Labour Subsidy	Skills
Skilled	1.84	0.11	-0.03	0.60	1.20	-1.52
Semi-skilled	9.17	0.22	-0.34	1.32	5.38	-0.15
Unskilled	24.22	0.27	-0.09	2.25	3.03	-0.23
Total	2.26	0.12	-0.04	0.64	1.36	-1.47

Source: Model results

Figure 14. Labour employment in the food sectors (change from base, 2030)



Source: Model results
NB: Values are expressed in millions of worked hours

Focusing on the food industry sector only (Figure 14), it emerges that the agropark scenario boosts labour employment in the newly created agropark sector, as desired.

Labour movement across regions and locations is also affected by all policy scenarios (Table 10 and Table 11). The urbanisation rate is expected to increase between 2016 and 2030 (UN population data). The model accounts for this increased urbanisation by allocating an exogenous quota of people moving from rural areas to small towns, and from small towns to urban areas. All rural development-oriented scenarios decrease the migration of people towards urban areas compared to the baseline, especially the skills, agropark and labour subsidy scenarios. All scenarios show the capacity of rural-oriented policies to reduce the movement of workers towards bigger city centres, due to increased absorption capacity for workers in rural areas. This is also confirmed by Figure 15.

Table 10. Ethiopian population by areas (% change from base, 2030)

	Base 2016	Base 2030	Agropark	Road	Irrigation	Livestock	Labour Subsidy	Skills
Rural	72,805,354	59,848,988	-0.76	-0.10	-0.10	-0.31	0.05	-3.22
Small T	7,034,660	33,540,476	2.63	0.27	0.30	0.59	0.98	0.96
Urban	21,834,782	35,814,312	-1.26	-0.10	-0.11	-0.05	-0.88	-1.42

Source: Model results

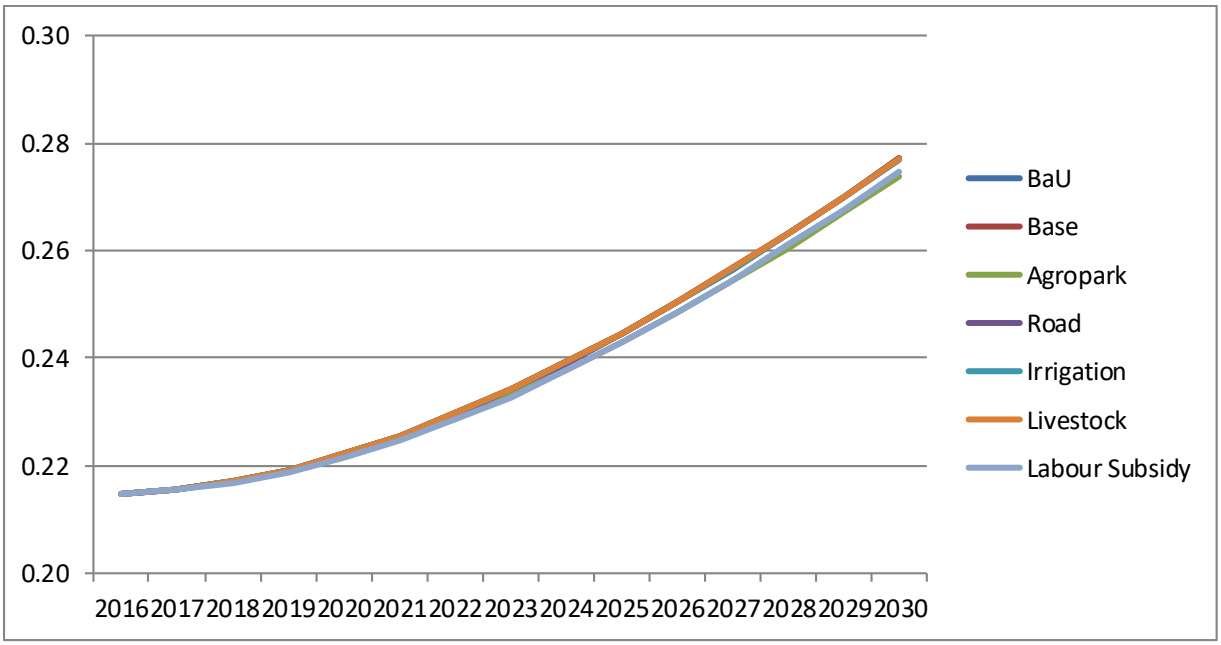
NB: Base 2016 and 2030 is in number of persons.

Table 11. Workers moving to urban areas (% change from base, 2030)

	Agropark	Road	Irrigation	Livestock	Labour Subsidy	Skills
Addis Ababa	-6.96	0.33	-0.45	-0.15	-2.87	-3.65
Afar - Urban	-1.52	0.09	-0.47	-0.19	-0.37	-1.84
Amhara - Urban	-1.22	0.20	-0.01	-0.09	0.08	-4.74
Dire Dawa - Urban	-1.97	0.50	-1.51	-0.12	-0.07	-3.92
Gambella - Urban	-0.71	0.20	-0.43	0.37	-0.77	-4.84
Harari - Urban	-0.64	0.20	0.06	0.14	0.85	-3.76
Oromia - Urban	-4.81	-0.15	-0.71	-0.46	-1.88	-4.12
SNNP - Urban	-5.53	0.06	-0.74	-0.52	-1.64	-5.36
Somali - Urban	-0.55	0.00	-0.13	0.14	0.30	-1.52
Tigray - Urban	-5.26	0.00	-0.47	-0.51	-2.25	-7.33
Total	**-4.42**	**0.02**	**-0.54**	**-0.35**	**-1.56**	**-4.41**

Source: Model results

Figure 15. Share of population living in urban areas (evolution by scenario, 2016 -2030)



Source Model results

Production factor income represents the sum of the returns paid from all activities to production factors (labour, land and capital), it is a combination of change in production factor returns (e.g. wages) and change in production factor demand by activities. Changes in production factor income are all positive, with some exceptions depending on the scenario and the specific production factor within each category (Table 12).

Labour income increases under all scenarios, as they all directly boost labour productivity or raise labour income, especially in rural areas (e.g. unskilled labour under the extension livestock scenario). Under the labour subsidy scenario, only unskilled labour is favoured (1.68%) as the policy highlighted aims to support the income of the least qualified labour. But given the weight of unskilled workers in wage labour, the final impact on labour income is positive. The scenario which has the biggest impact on labour income is the skills one, which directly increases labour productivity, making all workers better off.

The irrigation scenario increases the rent to irrigated land (9%), as its productivity is positively affected. Returns to capital increase most under those scenarios where investment in such a production factor is

relatively higher, such as investments in agropark (2.73%), with livestock capital benefiting the most (4.19%). Rural skills enhancement is the scenario which most affects production factor income (2.9%).

Table 12. Production factors income (% change from base, 2030)

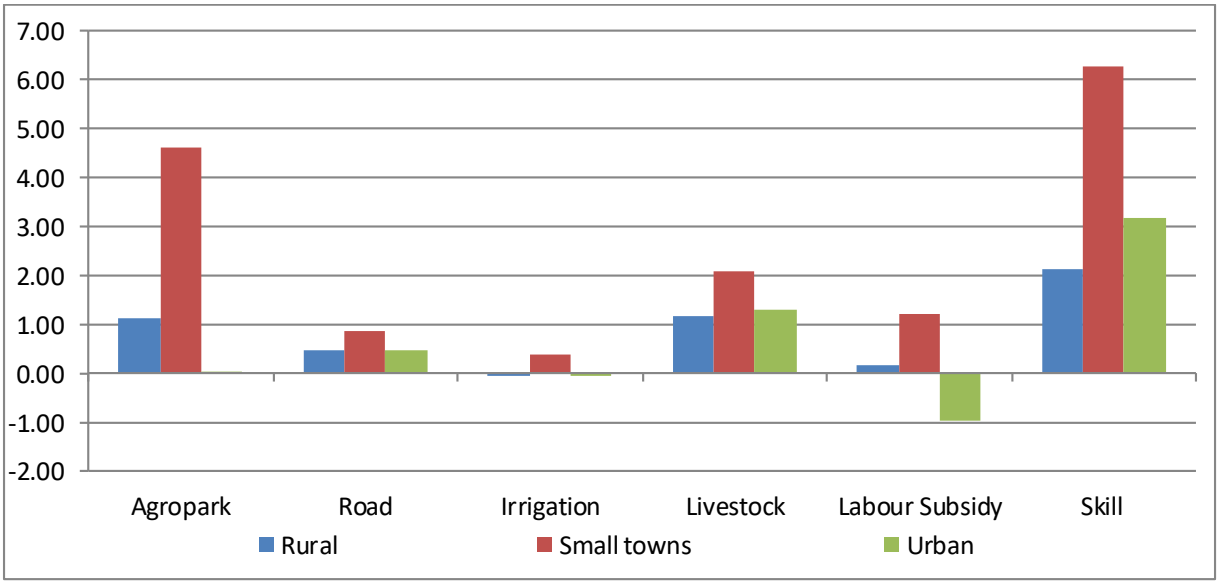
	Base 2016	Base 2030	Agro-park	Road	Irriga-tion	Live-stock	Labour Subsidy	Skills
Labour	765.82	1222.31	3.37	0.74	0.31	1.69	0.70	5.14
Skilled	133.29	179.41	-0.66	0.72	0.26	1.10	-3.18	6.23
Semi-skilled	101.18	141.10	1.92	0.70	0.43	0.96	-0.59	5.01
Unskilled	531.35	901.80	4.40	0.75	0.31	1.93	1.68	4.95
Land	106.97	159.53	-2.30	0.67	0.98	0.79	-0.08	1.10
Irrigated	2.87	4.31	-1.02	0.68	9.00	0.73	-0.05	1.23
Non-irrigated	104.11	155.22	-2.34	0.67	0.76	0.79	-0.08	1.10
Capital	552.59	1619.20	2.73	0.24	-0.45	0.88	-0.90	1.38
Livestock	38.72	122.98	4.19	-0.40	-1.76	-0.48	-0.39	-0.59
Non-agric.	513.87	1496.21	2.61	0.30	-0.35	0.99	-0.94	1.54
TOTAL	*1425.39*	*3001.04*	*2.72*	*0.47*	*-0.07*	*1.21*	*-0.20*	*2.90*

Source: Model results

NB: Base is in billion ETB.

The impact of policy scenarios on household income is positive and in some cases appreciable, with very few exceptions (Figure 16). Rural household income increases under all policy scenarios. Income in rural areas appears to be favoured by scenarios such as skills enhancement (2.12%), investment in agropark (1.12%) and livestock extension (1.15%). The same holds for small town household income, which shows the largest increase under the same scenarios, i.e. skills (6.29%), agropark (4.60%) and livestock (2.06%). The labour subsidy scenario has low direct impact on household income. When looking at urban household income, the pattern is more differentiated and changes are smaller, although positive in most scenarios except labour subsidy.

Figure 16. Household income by area (% change from base, 2030)



Source Model results

5.2 Agricultural markets

All scenarios increase agri-food production, except the labour subsidy scenario which presents a small decrease (0.25%) (Table 13). Investing in agropark benefits agri-food production the most (19.04%), while building new transport infrastructure and improving rural roads and improving rural education increase non agri-food production.

All scenarios except labour subsidy benefit HPHC production, with rural skills enhancement being the most effective (4.27%). Together with rural road improvement, these are the only scenarios which present positive effects in the production of every agri-food (except cut flowers for the skills scenario) and non agri-food product.

Table 13. Home Production for Home Consumption and marketed production (% change from base, 2030)

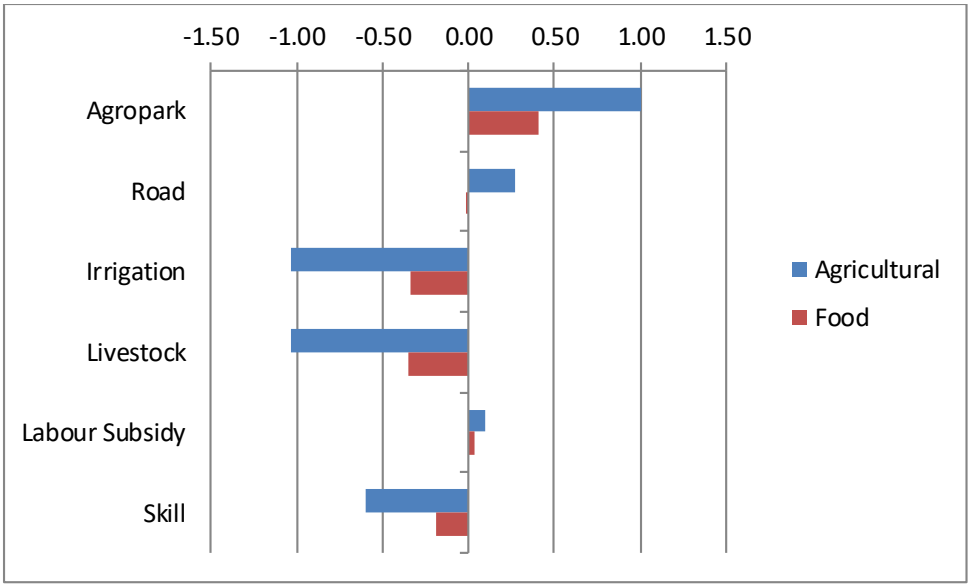
	Base 2016	Base 2030	Agropark	Road	Irrigation	Livestock	Labour Subsidy	Skills
Agri-food	626.09	1,162.99	19.04	0.62	0.78	2.61	-0.25	3.69
Home consumed	251.33	395.72	2.98	0.18	1.25	3.15	-0.13	4.27
Crops	211.98	330.69	3.02	0.15	1.26	3.22	-0.13	4.32
Food staples	177.18	277.40	2.96	0.16	1.26	3.20	-0.12	4.31
Cash crops	34.80	53.29	3.32	0.12	1.29	3.32	-0.15	4.37
Livestock	39.35	65.03	2.80	0.30	1.16	2.82	-0.15	4.00
Marketed	374.76	767.27	27.33	0.85	0.53	2.33	-0.32	3.40
Agriculture	301.36	547.90	6.02	0.66	1.17	2.85	-0.29	3.57
Crops	213.65	378.01	7.39	0.69	1.61	3.19	-0.30	3.74
Food staples	189.66	340.86	7.14	0.65	1.60	3.13	-0.33	3.72
Cash crops	23.99	37.15	9.71	1.00	1.68	3.70	-0.03	3.90
Livestock	82.83	154.32	4.09	0.56	0.16	2.38	-0.32	3.59
Cut flowers	4.89	15.57	-8.27	0.92	0.39	-0.82	0.34	-0.75
Food	73.39	219.37	80.55	1.35	-1.05	1.03	-0.39	2.97
Non agri-food	1,500.18	4,407.81	0.01	1.33	-1.83	-0.67	-1.24	0.99
Primary	83.27	197.25	0.03	1.66	-1.26	0.04	0.04	2.41
Light manufacturing	48.91	199.39	-3.53	2.90	-2.78	-0.62	-1.12	1.17
Heavy manufacturing	57.92	175.18	2.51	1.38	-1.43	-0.51	-0.13	0.12
Utilities	27.32	85.06	2.64	2.72	-1.82	0.09	-1.07	1.25
Construction	393.91	926.63	3.35	2.15	-0.54	-0.66	-0.61	0.20
Services	888.87	2,824.30	-1.07	0.89	-2.25	-0.77	-1.61	1.18

Source: Model results

NB: Base is in billion ETB.

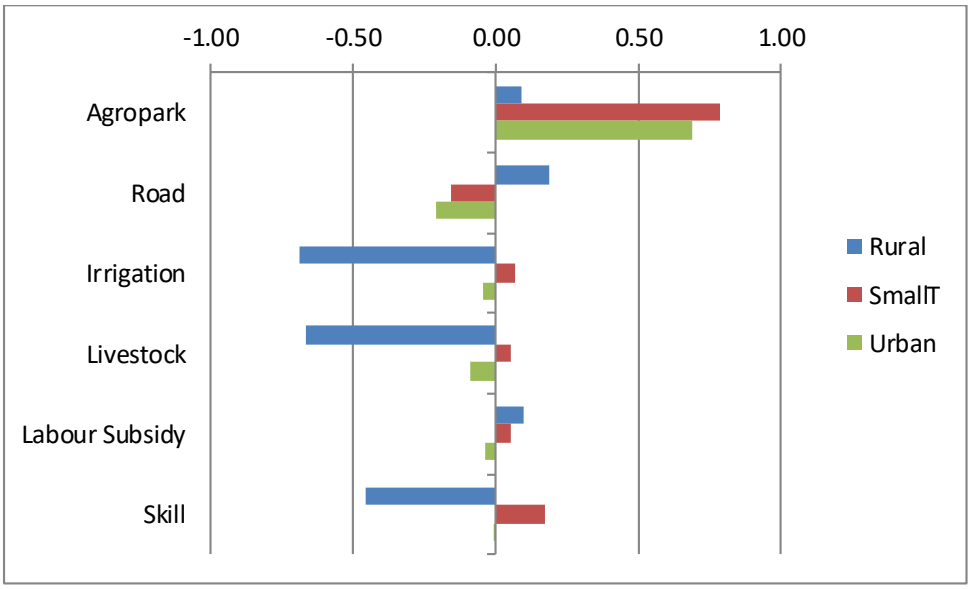
The change in prices suggests that empowering extension services in rural areas, for livestock activities and irrigation systems, has the greatest price decrease impacts for agricultural and food products. This effect is greater in the agricultural sector than in the food sector (Figure 17), while from a spatial perspective effects are more pronounced in rural areas (Figure 18). Overall, purchaser prices for agri-food composite commodities decrease the most in Addis Ababa, in all scenarios but agropark and irrigation which present price increases (Figure 19).

Figure 17. Purchaser price for agricultural and food commodities by scenario (% change from base, 2030)



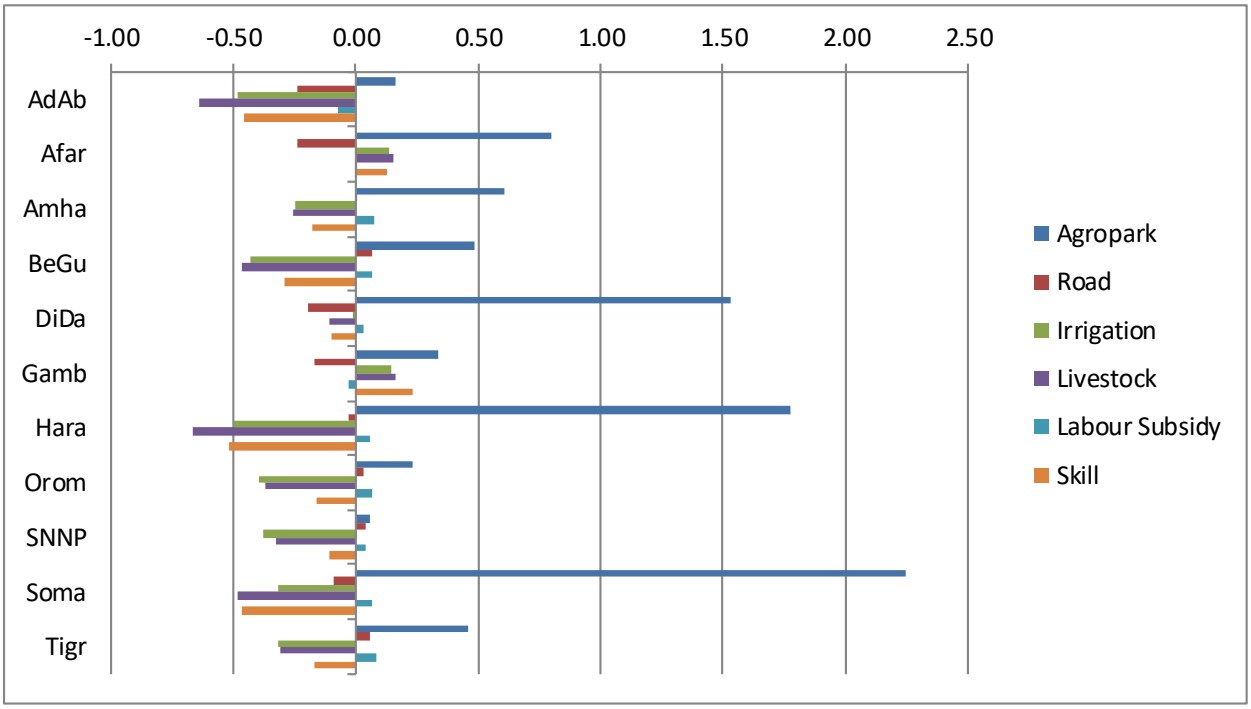
Source Model results

Figure 18. Purchaser prices for agri-food composite commodities by area (% change from base, 2030)



Source Model results

Figure 19. Purchaser prices for agri-food composite commodities by region (% change from base, 2030)



Source: Model results

Agricultural and food commodities represent about 68% of Ethiopian exports in the 2030 baseline. Cut flowers alone account for about 60%, followed by coffee, oilseeds, pulses, horticulture and meat products (see Tables A1.2 and A1.3 in Annex 1). By contrast, agricultural and food commodities represent less than 10% of Ethiopian import; about half are food products. The impact on imports is consistent with the impact on exports, and is significant for most commodities (see Tables A1.2 and A1.3 in Annex 1). The agropark scenario is the one with higher trade effects. Together with the skills and road scenarios, the increase in imports should be considered in line with the increase in wealth.

The Ethiopian position in international agricultural markets is improving, as policy changes strengthen competitiveness for certain sectors such as food (agropark scenario), crops (irrigation and livestock scenarios), and livestock (livestock scenario) (Table 14). The agropark scenario shows a significant improvement to the overall Ethiopian trade bill.

Table 14. Trade balance by sectors (billion ETB change from base, 2030)

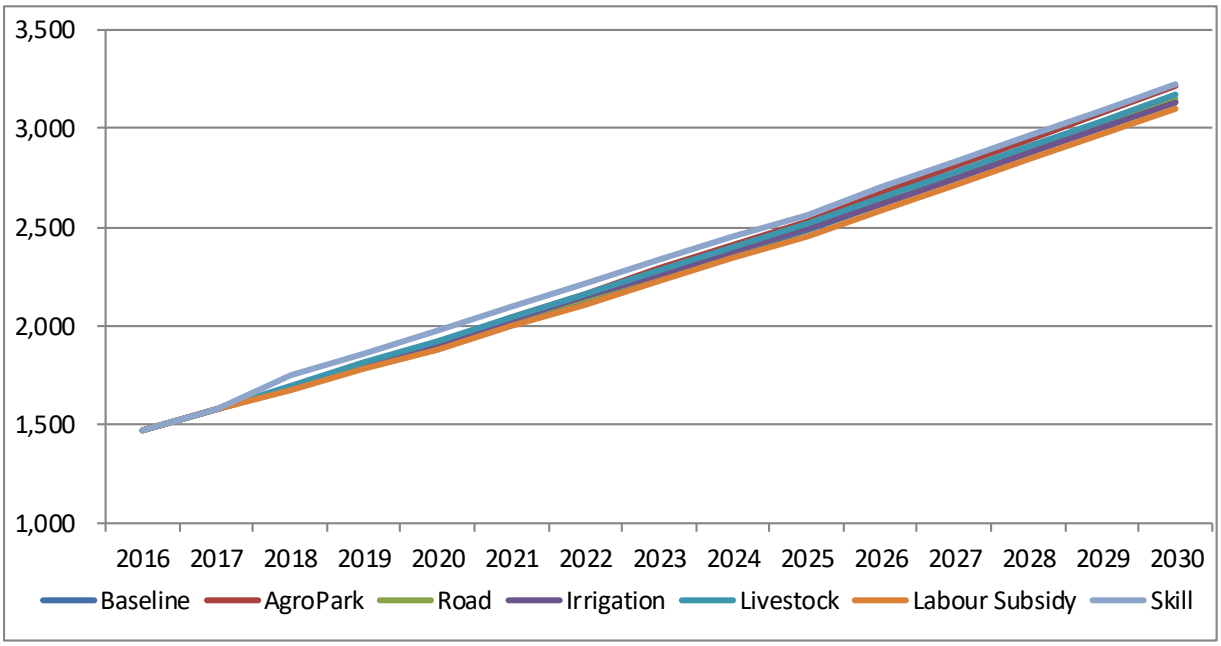
	Base 2016	Base 2030	Agropark	Road	Irrigation	Livestock	Labour Subsidy	Skills
Crops	15.17	1.34	-21.23	-0.97	2.67	2.99	-0.32	0.94
Cut Flowers	4.79	9.29	0.01	0.00	0.00	0.00	0.00	0.00
Livestock	6.12	15.36	-5.46	0.15	0.18	0.59	-0.07	0.67
Food	-21.05	-37.08	168.03	-0.42	0.15	-0.49	0.24	-1.55
Non agri-food	-307.19	-454.70	-139.87	1.27	-3.10	-3.05	0.05	0.14
Total	-302.16	-465.80	1.48	0.03	-0.09	0.04	-0.10	0.20

Source: Model results

5.3 Welfare indicators and public finance

As shown in section 5.1, FAO macroeconomic projections envisage a dramatic growth in the real GDP of Ethiopia. Figure 20 also highlights that the policy scenarios do not significantly affect the GDP growth path over the period considered (2016-2030). Focusing only on the last year and on GDP per capita (Figure 21), it emerges that most scenarios generate a positive impact on national per capita income, especially the skills, agropark and livestock scenarios. On the contrary, per capita GDP growth decreases with respect to the baseline under the labour subsidy scenario, by about 1%. This is because, from a market perspective, the efficient allocation of resources achieved by free market allocation is exogenously changed to channel resources to less efficient uses (i.e. unskilled rural labour).

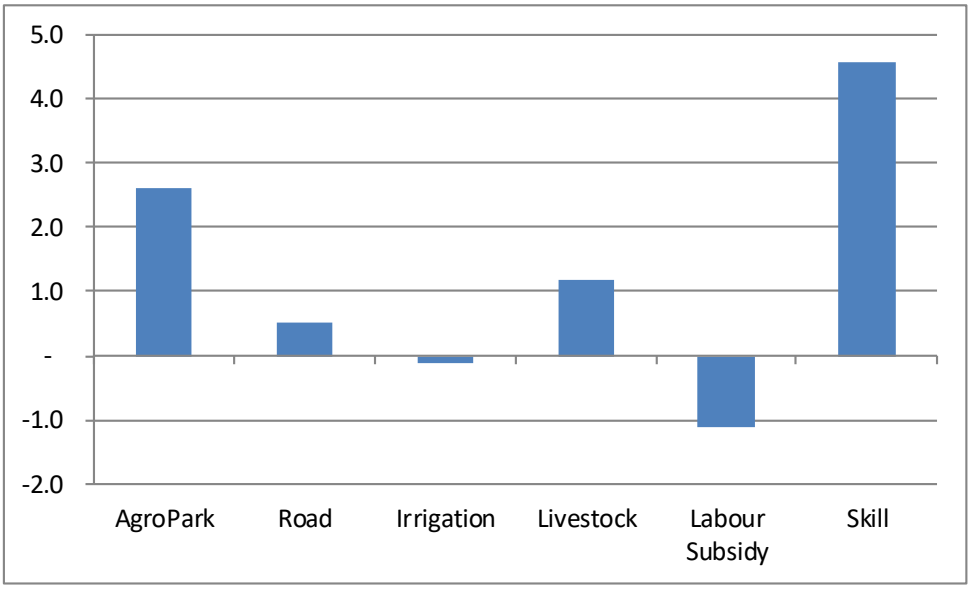
Figure 20. Evolution of real GDP by scenario (2016-2030)



Source Model results

Importantly, GDP per capita grows by 82.3% over the period 2016-2030. Figure 21 shows the percentage change in GDP per capita by scenario, with respect to the baseline, in the year 2030. Thus the change in GDP per capita corresponds to the change over the period (i.e. 82.3%), increased or decreased by the scenario impact.

Figure 21. % change in GDP per capita (% change from baseline, 2030)



Source Model results

5.4 Sustainable Development Goals

The DEMETRA CGE model computes Sustainable Development Goal (SDG) indicators, following Philippidis et al (2018) and M'barek et al. (2019)[13]. What follows are some figures showing the effects of various scenarios on a selection of indicators related to three critical SDGs: SDG2: Zero Hunger, SDG8: Decent work and economic growth and SDG10: Reduced inequalities. Capturing sometimes conflicting effects, with different magnitudes, in one figure allows us to shed better light on policy trade-offs. Note that additional SDGs (and indicators) are generated by the CGE model, and that what follows should be interpreted as an illustrative sample.

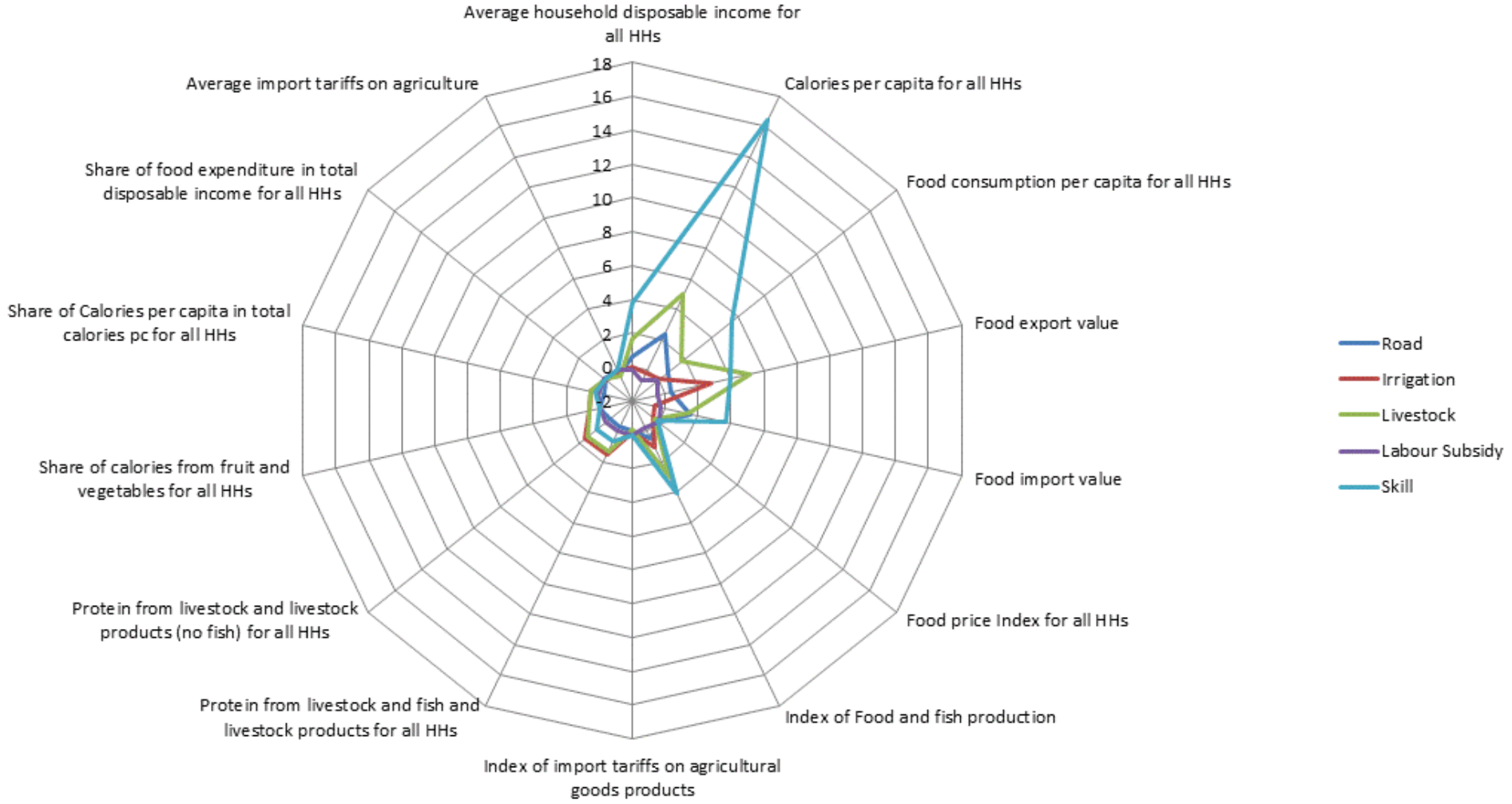
An overview of indicators included in SDG2 shows a generalised positive effect on these indicators under most of the scenario, in particular skill and agroparks (Figure 22 and Figure 23).

As related to SDG8 and SDG10 (Figure 34), the agropark scenario shows positive sign under all indicators, from increasing GDP, reducing the wage gap between skilled and unskilled and a significant improvement of the net trade position.

Most of other scenarios, even if with a lower intensity, show generalised improvement in terms of SDGs.

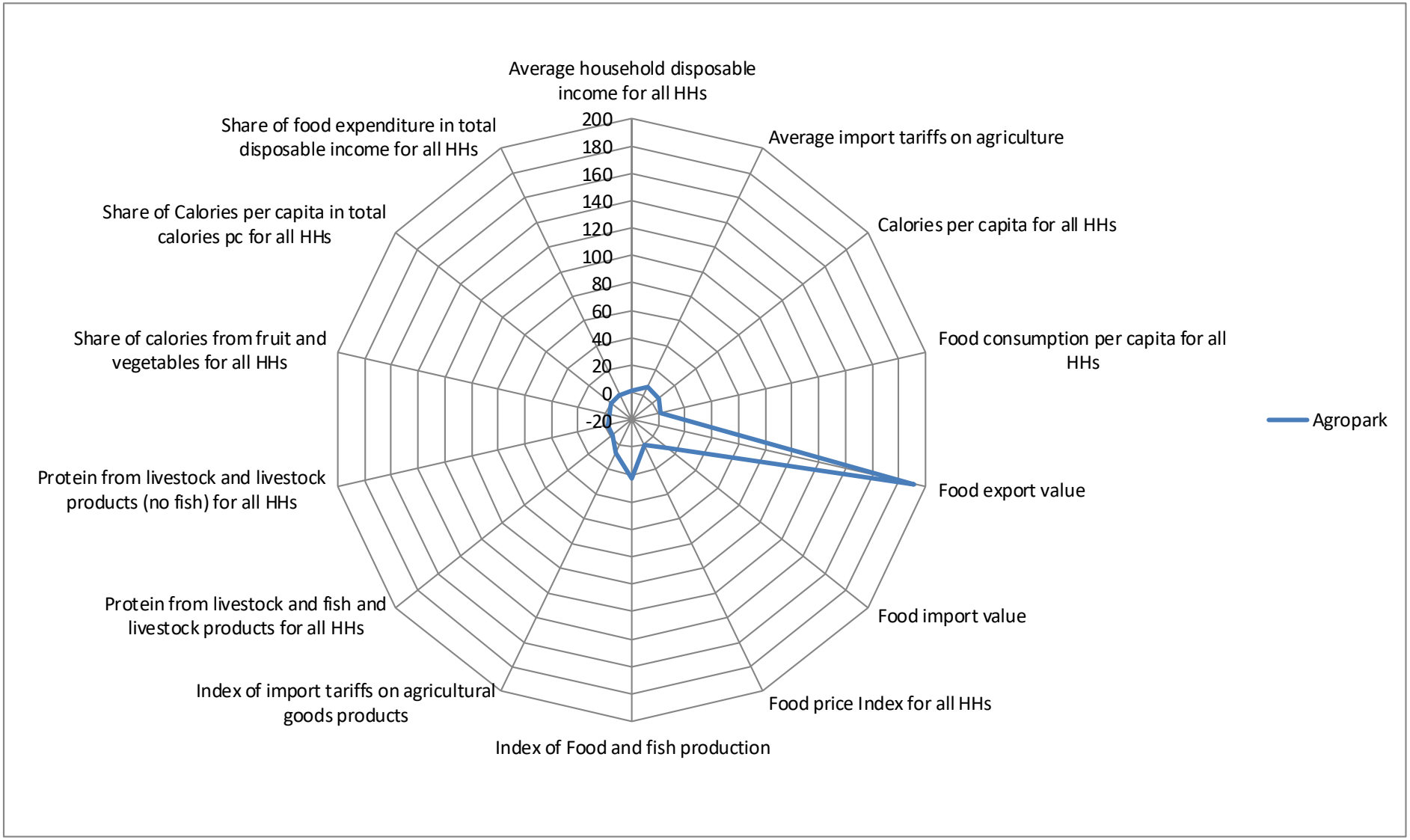
[13] The methodology and coding to depict model outcome in the SDG framework has being developed since 2017 for the Modular Applied GeNeral Equilibrium Tool (MAGNET) with a global coverage. It is co-developed and co-funded by Wageningen Economic Research (WeCR) and the European Commission - Joint Research Centre, Seville (JRC.D.4).

Figure 22. Addressing SDG2: Zero Hunger, by scenario and selection of indicators (% change from baseline, 2030)



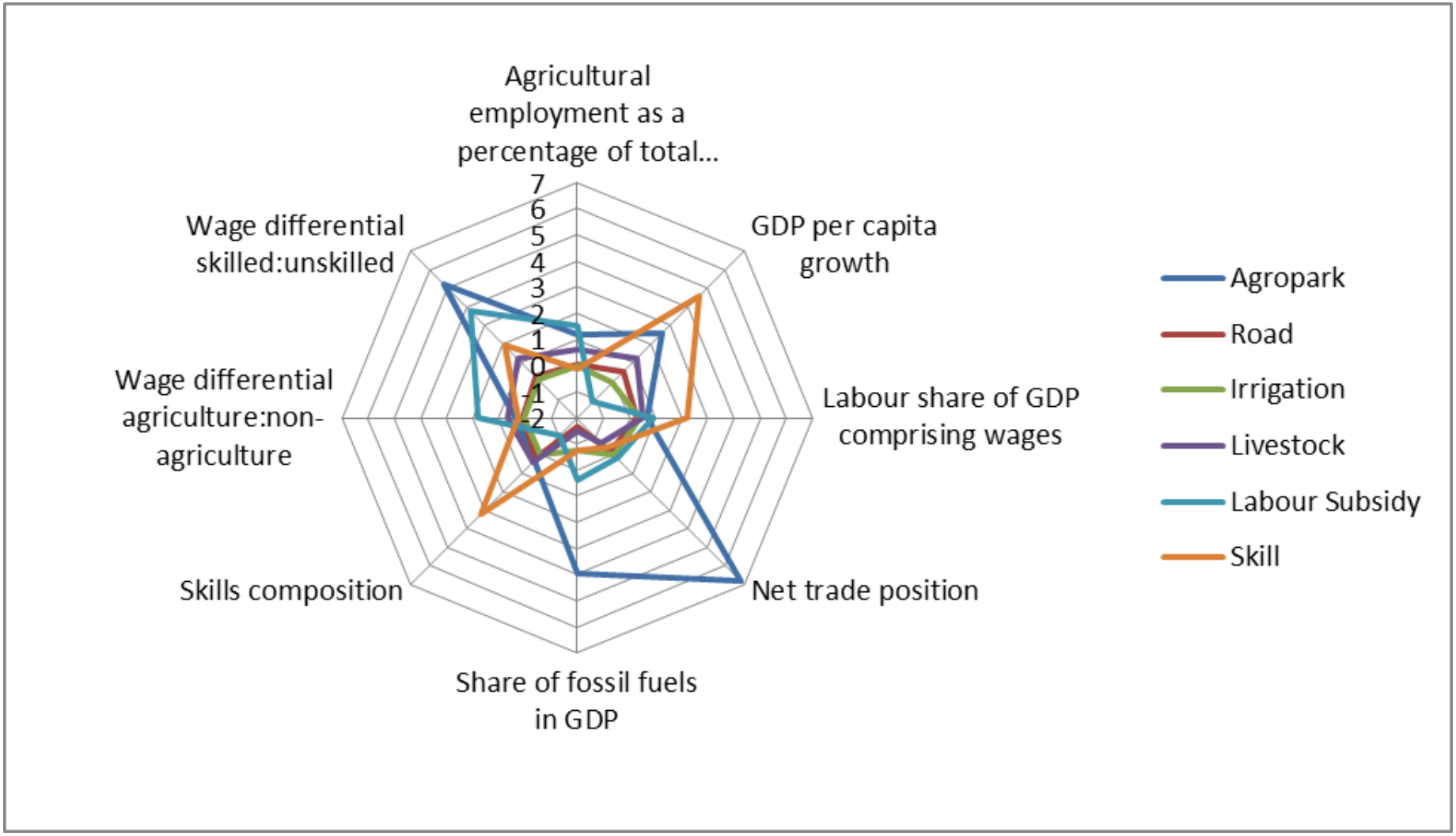
Source Model results

Figure 23. Addressing SDG2: Zero Hunger, agropark scenario and selection of indicators (% change from baseline, 2030)



Source: Model results

Figure 24. Addressing SDG8: Decent work and economic growth and SDG10: Reduced inequalities, by scenario and selection of indicators (% change from baseline, 2030)



Source Model results

Table 15. Addressing SDG2: Zero Hunger - Change in the nutritional composition of household consumption (% change, 2030)

	Agropark	Road	Irrigation	Livestock	Labour Subsidy	Skills
Calories	0.38	0.60	0.38	2.13	-0.47	5.54
Rural	0.78	0.52	0.56	2.35	-0.54	5.93
Small town	0.84	0.70	0.23	1.84	-0.28	5.63
Urban	-0.40	0.69	0.19	1.93	-0.45	4.93
Fats	1.45	1.05	-0.48	1.29	-0.39	5.00
Rural	1.13	0.97	-0.38	1.42	-0.41	5.22
Small town	2.44	1.08	-0.49	1.16	-0.16	5.33
Urban	1.31	1.10	-0.55	1.24	-0.46	4.70
Proteins	1.40	0.92	-0.37	1.38	-0.40	5.04
Rural	1.23	0.81	-0.16	1.64	-0.44	5.39
Small town	2.27	0.98	-0.48	1.14	-0.17	5.23
Urban	1.20	0.99	-0.51	1.25	-0.46	4.63

Source: Model results

6 Conclusion and recommendations

6.1 Conclusions

This report provides a quantitative assessment of policy options to support the Rural Job Opportunity Creation Strategy in Ethiopia. It also describes the Ethiopian political context and economy, with a focus on employment generation capacity, based on a recent and disaggregated SAM developed by the JRC, and a linear multipliers model.

The report proposes an *ex ante* assessment of policy options, with a focus on the labour market, employing a CGE model that fits key developing country specificities, such as the own supply of food by semi-subsistence households (both through the HPHC module and the multiple-output structure of the CGE model), calibrated on a SAM for Ethiopia for 2015, jointly estimated by the Ethiopian Development Research Institute and the JRC.

The main findings of the study are as follows.

- All of the simulated scenarios show potential for increasing job creation in the agricultural and food sectors, particularly if stimulated with investment policies such as the expansion of agroparks.
- The increase in labour demand brings about an increase in wages under almost all scenarios. This increase is particularly significant under scenarios specifically designed to increase labour productivity such as the skill-based one, which aims to help create better-paid jobs.
- An additional effect of policies fostering rural job opportunities is the reduction of workers migration towards urban areas, in particular Addis Ababa.
- Total employment is barely affected by the simulated policies. This is partly due to the model structure and lack of available data on real levels of employment or underemployment.
- The positive outlook associated with the simulated policies is underlined by the increase in production factor income and consequently in household income associated with most scenarios.
- The only scenario associated with a decline in income is the one based on labour subsidies. This scenario is able to support the income of the poorest but at the same time creates a distortion in the economy which reduces the overall economic activity compared to the baseline. To avoid these negative effects, this policy should be accompanied by others designed to avoid a decrease in Ethiopian economic growth.
- Fostering agro-industrial parks benefits food production the most with a massive increase in food exports and an improvement of the trade bill. This scenario also increases agri-food prices in the Ethiopian market.
- Livestock extension services and irrigation have the greatest impact in terms of reduction in the price of agricultural and food products.
- Enhancing skills on the one hand, while fostering extension services in rural areas targeting livestock production on the other, are the most effective policy options for food and nutrition security.
- Investing in road infrastructure and education has the greatest effects on the production of non agri-food products, allowing for a broader development of the economy.
- The simulated scenarios have a positive effect on most of the indicators underpinning critical SDGs, such as SDG2: Zero Hunger, SDG8: Decent work and economic growth and SDG10: Reduced inequalities.

This study is based on simulations performed using a CGE economic model. These models provide a schematic representation of the economy which cannot reproduce reality in its full complexity. The quality of the model output is directly related to the input data and to the parameters associated with the shocks imposed on the model. The effort expended in the production of an accurate and updated database is huge; nevertheless, missing data and the lack of publicly accessible datasets might bias some of the results. Not all parameters can be econometrically estimated and, despite the fact that some of them are available in the literature, scenario results should not be considered as definite numerical forecasts of the future impacts of a given policy but rather be interpreted as a way of understanding the forces that each shock unleashes.

It should also be emphasised that only the economic impacts of the shocks analysed are fully depicted by the model. Environmental impacts (e.g. water availability and the sustainable withdrawal of water and other natural resources, particularly relevant to the irrigation scenario) or social impacts (e.g. non-economic reasons behind the decision to migrate) are only partially taken into account because of the characteristics of the model. Finally, as the institutional framework behind any policy reform or change cannot be modelled, the model implicitly assumes political stability in the country and assumes that reforms will (in the medium term) bring expected results. The uncertainty behind all model assumptions is relevant in defining the final results of any policy reform in any country.

To conclude, it is worth emphasising that the JRC constantly strives to increase the scope and quality of the models employed for policy analysis. There is ongoing enhancement of modules to improve analysis of demography, household demand for final goods, nutritional indicators, inclusion of water and connections with other natural resources, environmental indicators and the SDGs.

6.2 Recommendations

Based on an assessment of the social and economic impacts of the various policy interventions, this report suggests the following recommendations in connection with the Rural Job Opportunity Creation Strategy in Ethiopia. Only policy directions are offered rather than concrete details, the construction of which we consider as separate work that must be done after overall policy directions are agreed by the bodies concerned.

1. Allocate a significant share of total public resources to the agricultural sector, as part of a broad structural transformation agenda.

The level of expenditures in support of food and agriculture still falls short of the 10% target. With this level of expenditure on agriculture, it would be difficult to achieve the envisaged structural transformation agenda. Therefore, a greater share of total public resources should be allocated to the agricultural sector. The effect on job opportunity creation in the agricultural and food industry sector is substantial.

2. Accelerate government investment in the livestock sector.

The analysis shows that livestock commodities have the greatest positive impact on employment generation, output and value added. Thus, accelerating government investment in the livestock sector should be considered. As available resources are limited, the government may need to redirect its investment more towards the livestock sector in order to unleash Ethiopia's livestock potential

3. Provide public support for the development of industrial parks and agro-processing industrial parks

The government of Ethiopia should continue to support and encourage the development of industrial parks and agro-processing industrial parks. As indicated by the model results, doing so generates the greatest gains in terms of job creation, especially for semi-skilled labour, in the sector. Moreover, it results in a significant improvement in the income of rural households, thereby reducing the poverty level in rural areas. The development of the sector will also be helpful in reducing the movement of workers towards bigger cities due to an increased absorption capacity of workers in rural areas. Rural-urban migration in Ethiopia currently poses a social challenge. The sector also brings about significant improvement in the country's trade deficit by increasing export earnings. Overall, the development of agro-industrial parks speeds up the structural transformation of agriculture, by supporting commercialisation through permanent rural-urban linkages, and has significant positive impacts on per-capita GDP.

4. Promote expenditure on education to enhance human capital productivity.

The government should increase expenditure on education, particularly in Agricultural Technical Vocational Education and Training (ATVET). This enhances labour productivity and labour force participation, generating employment opportunities. It also results in an increase in the wages and incomes of workers associated with the creation of "better" (more skilled) jobs, and has the advantage of reducing population pressure in the long run.

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List of abbreviations and definitions

AGP	Agriculture Growth Programme
ATVET	Agricultural Technical Vocational Education and Training
CAADP	Comprehensive Africa Agriculture Development Programme
CES	constant elasticity of substitution
CGE	Computable General Equilibrium
CSA	Central Statistics Agency
CRGE	Climate Resilient Green Economy
DEMETRA	Dynamic Equilibrium Model for Economic Development, Resources and Agriculture
EDRI	Ethiopian Development Research Institute
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GTP I	Growth and Transformation Plan I (2010-2015)
GTP II	Growth and Transformation Plan II (2015-2020)
HPHC	Home Production Home Consumption
ILO	International Labour Organization
JRC	Joint Research Centre
LFSP	Livestock and Fisheries Sector Plan
LMP	Livestock Master Plan
MAFAP	Monitoring and Analysing Food and Agricultural Policies
nec	not elsewhere classified
mha	million hectares
MoANR	Ministry of Agriculture and Natural Resources
RJOCS	Rural Job Opportunity Creation Strategy
SAM	Social Accounting Matrix
SDGs	Sustainable Development Goals
SLMP	Sustainable Land Management Programme
SNNP	Southern Nations, Nationalities, and Peoples' Region
USD	US dollar

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Table A1.1. Basic structure of flows in the Ethiopia SAM 2015/16

	ch	cm	m	ahf	a	flab	fland	flivst	fcap_ag	fcap_na	hh	enter	gov	dirtax	indtax	saltax	facttax	imptax	i_s	row
HPHC commodities (ch)				X							X									
Marketed commodities (cm)			X	X	X						X		X						X	X
Margins (m)		X																		
Households as activities semi-subsistence (ahf)	X	X																		
Activities (a)		X																		
Labour factor (flab)				X	X															X
Land factor (fland)				X	X															
Livestock (flivst)				X	X															
Capital agricultural (fcap_ag)				X	X															
Capital non-agricultural (fcap_na)					X															
Households (hh)						X	X	X	X	X		X	X							X
Enterprises (enter)							X	X	X	X			X							X
Government (gov)										X		X		X	X	X	X	X		X
Direct taxes (dirtax)											X	X								
Indirect taxes (indtax)					X															
Sales taxes (saltax)		X																		
Factor taxes (facttax)						X														
Imports taxes (imptax)		X																		
Save/Investment (i_s)											X	X	X							X
Rest of the World (row)		X				X					X		X							

Source: Own elaboration

Table A1.2. Exports by sectors (% change from baseline, 2030)

	Base 2016	Base 2030	Agropark	Road	Irrigation	Livestock	Labour Subsidy	Skills
Cash Crops	17.84	20.84	-13.01	-0.62	4.16	6.36	-0.20	5.04
Coffee	17.47	20.28	-13.01	-0.65	4.19	6.43	-0.21	5.04
Cotton, fibres	0.28	0.45	-13.60	0.62	3.16	3.64	0.03	5.12
Leaf tea	0.08	0.10	-10.03	0.00	3.01	4.85	0.51	4.74
Food Staples	20.39	32.36	-7.41	0.00	3.32	5.36	-0.48	4.54
Fruits and nuts	0.14	0.28	-15.47	0.52	5.60	7.05	0.12	5.19
Maize	0.00	0.00	-18.95	-0.25	4.69	6.54	-0.40	4.87
Other crops	0.61	0.89	-23.37	-1.17	4.92	9.38	-1.17	9.04
Other oilseeds	13.00	23.46	-4.21	0.38	2.75	4.42	-0.45	3.94
Pulses	5.69	6.15	-13.47	-1.20	4.22	7.18	-0.44	5.59
Vegetables	0.94	1.57	-20.89	-0.50	7.16	9.73	-0.72	6.74
Livestock	6.28	15.75	-33.78	0.96	1.01	3.60	-0.43	4.21
Poultry	0.00	0.00	-26.72	-0.70	6.43	9.76	-0.32	8.34
Raw milk	0.15	0.16	-23.53	-1.71	3.35	9.70	-0.56	6.39
Sheep	4.11	6.60	-30.97	-0.39	3.04	4.80	-0.09	5.39
Meat products	2.02	8.99	-36.03	2.00	-0.51	2.61	-0.68	3.31
Food	1.06	5.82	2,998.54	2.32	-1.40	1.56	-0.49	2.25
Non agri-food	71.50	460.96	-16.06	2.65	-4.30	-1.91	-0.92	0.61
Construction	0.26	1.18	-9.07	2.03	-2.65	-1.43	-0.90	0.72
Heavy Manufacturing	3.66	12.37	2.90	3.78	-1.16	-0.54	0.27	-1.23
Light Manufacturing	3.53	23.62	-16.51	3.52	-3.64	-0.98	-0.25	0.80
Primary	0.40	1.45	-10.86	2.90	-2.04	-1.09	-0.88	1.23
Services	63.66	422.35	-16.62	2.56	-4.44	-2.01	-0.99	0.65
TOTAL	121.91	545.16	16.51	2.27	-3.27	-0.94	-0.83	1.12

Source: Model results

NB: Base is in billion ETB

Table A1.3. Imports by sectors (% change from baseline, 2030)

	Base 2016	Base 2030	Agropark	Road	Irrigation	Livestock	Labour Subsidy	Skills
Cash Crops	0.54	1.30	29.61	3.06	-3.75	-2.52	0.16	-0.21
Coffee	0.02	0.10	111.66	6.20	-5.38	-3.18	0.34	0.83
Cotton, fibres	0.51	1.19	22.84	2.82	-3.64	-2.49	0.15	-0.33
Leaf tea	0.01	0.01	36.25	0.74	-1.38	-0.08	-0.43	3.05
Food Staples	22.53	50.56	31.12	1.58	-1.35	0.21	0.25	3.13
Barley	0.25	0.67	31.27	1.95	-2.43	-1.23	0.23	3.96
Fruits and nuts	0.13	0.21	38.63	0.70	-2.68	-1.38	-0.65	2.45
Maize	0.12	0.23	35.83	1.09	-2.18	-0.86	0.35	3.29
Other crops	5.50	8.13	45.33	1.36	-2.51	-2.81	0.41	-0.35
Other oilseeds	0.02	0.05	118.70	3.38	-4.08	-1.59	-0.25	0.89
Pulses	1.94	5.05	31.49	1.78	-2.16	-1.01	0.00	2.95
Vegetables	0.18	0.33	51.66	1.71	-4.13	-3.44	0.21	0.98
Wheat	14.39	35.90	27.46	1.60	-0.91	1.14	0.25	3.96
Cut Flowers	0.05	0.14	-8.53	2.38	-1.68	-0.25	0.09	1.56
Livestock	0.15	0.39	35.24	0.03	-5.90	-5.27	-0.48	-1.82
Cattle	0.11	0.23	11.17	-0.67	-6.31	-5.87	-0.79	-2.57
Poultry	0.04	0.14	57.27	0.86	-5.85	-4.95	-0.02	-1.26
Raw milk	0.00	0.00	56.20	2.40	-2.79	-2.88	-0.32	1.39
Meat products	0.01	0.02	158.19	1.87	-1.68	-0.67	-0.28	2.72
Food	22.10	42.90	14.93	1.29	-0.55	1.35	-0.62	3.91
Non agri-food	378.70	915.66	7.19	1.19	-1.83	-0.63	-0.47	0.29
Construction	15.86	19.22	17.52	2.27	1.62	0.12	-0.32	-0.32
Heavy Manufacturing	182.99	427.16	4.99	-0.50	-1.44	-0.55	0.04	-0.06
Light Manufacturing	113.83	374.28	7.21	3.05	-2.80	-1.12	-1.06	0.44
Primary	0.56	0.95	23.13	3.80	1.45	1.89	1.89	-1.67
Services	65.46	94.05	14.86	1.25	-0.45	0.74	-0.46	1.45
TOTAL	424.07	1,010.95	8.76	1.22	-1.75	-0.51	-0.44	0.59

Source: Model results
NB: Base is in billion ETB

Annex 2. Additional scenarios

This Annex presents two additional scenarios excluded from the report to ease its readability. Modelling results are available on request from the authors.

2.1. Provision of Extension services for crop production - Extension

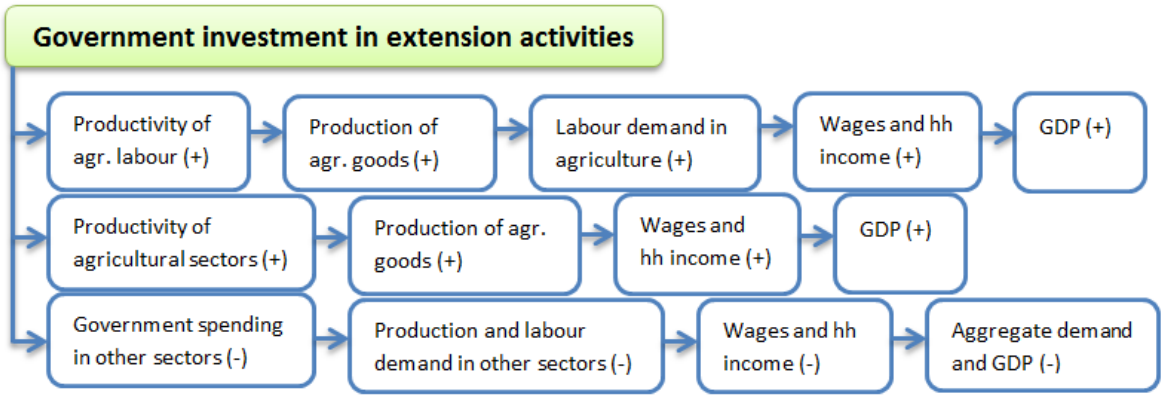
The government of Ethiopia believes that an effective and efficient extension system, which facilitates the adoption of agricultural technologies that increase yield and quality, can convert a smallholder subsistence agriculture sector into a commercial agricultural system. With approximately 21 development agents per 10,000 farmers, Ethiopia has one of the densest agricultural extension systems in the world (NPC, 2016).

The shift towards production of high value export crops (e.g. coffee, spices, horticulture, oilseeds) benefits smallholder farmers, increases participation by women and youth in rural economic activity, and reduces poverty by helping family farms move from traditional to improved market-oriented systems. The provision of extension services in rural areas also increases productivity for other high value commodities, such as livestock products (skins and hides, leather, live animals and meat), pulses, textiles, natural gum and mineral products. Currently, there are around 455 agro-processing companies engaged in processing nationally and internationally traded agricultural products, whose activity largely depends on local raw materials produced by smallholder farmers.

The model includes feedback from changing expenditure to corresponding changes in the productivity of labour and of input use (fertilisers and seeds). Spending on extension services allow farmers to use fertiliser and seeds in a more efficient way and also increase the productivity of their farms. Urgessa (2015) estimates a ratio of labour and land productivity increase to extension service equal to 0.142. Any evidence of higher elasticity will lead to a call for increased budgetary allocation.

To perform this scenario, an extension services activity has been introduced into the SAM to produce extension services, using data from the FAO-MAFAP public expenditure database. The cost structure of extension activity is identical to that of public administration activity. The production of extension services is purchased by government. Whilst the consequent increase in rural labour productivity generates rural employment, the lower public expenditure on other sectors reduces the demand for labour in these sectors and may decrease demand for labour in rural areas (Figure A2.1).

Figure A2.1. Main variables affected by the Extension scenario



Source Own depiction.

2.2. Government revolving fund – Revolving fund

The government allocated ETB 10 billion to a youth development package, which focuses on improving employment opportunities, expanding economic benefits and increasing accessibility of finance. Entry barriers in the off-farm labour market, due to lack of money for equipment purchase or rent, represent a major obstacle in Ethiopia. If households face binding liquidity and credit constraints, they cannot afford the investment required in the off-farm labour market. To tackle such problems, the Ethiopian government introduced a youth revolving fund, from the budget allocated by the Federal Government. The fund's objective

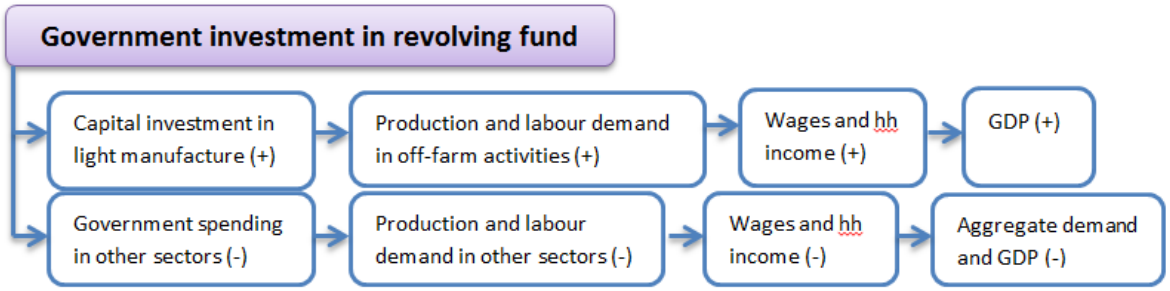
is to provide financial assistance for organised income-generating activities conducted by youth. The funds will be used for the supply of capital goods necessary for implementing income-generating projects, proposed by beneficiaries and supported by the appropriate authority and by microfinancing institutions or banks. The proceeds of the fund will be transferred to beneficiaries on a loan basis. This should increase production in some of the selected sectors, and increase demand for labour.

Access to credit can play a key role in expanding rural non-farm activities, by promoting entrepreneurship, company growth, and non-farm employment in rural areas (Banerjee, 2013). Evidence also indicates a strong association between rising rural non-farm employment and a decline in poverty in developing economies. The Urban Migration Study (World Bank, 2010) reported that more than 42% of migrants stated they would not have migrated if they had been able to make a living back home, and their main reason for migration is lack of capital to start their own business. Shortage of land and of employment opportunities in rural areas are the primary motivations for migration (Zeleke et al., 2008). Hence, providing rural youth with capital, through microcredit and revolving funds, would enable them to engage in off-farm activities.

When the medium- and small-scale enterprises strategy was adopted in 2011 to create job opportunities for youth, microfinance was identified as an important source of finance for start-up enterprises. By the same token, in the GTP II, microfinance institutions were expected to expand their financial services through covering at least 50% of rural areas (NPC, 2016).

Modelling the revolving fund is not an easy task, as it requires details which are missing from the database. Nonetheless, its impact can be approximated. The provision of microfinance is simulated via a subsidy to non-agricultural capital employed in light manufacturing activities (wood and metal workshops, tailoring and sewing, weaving and pottery making). The subsidy increases the provision of capital and the production of these activities. On the other hand, provision of the revolving fund to youth decreases recurrent expenditure by the government on other sectors, which is expected to reduce demand for labour by other sectors. The net effect of these two aspects of this scheme eventually determines the net impact on demand for labour in rural areas (Figure A2.2).

Figure A2.2. Main variables affected by the Revolving fund scenario



Source Own depiction.

Annex 3. On-line resources

Most of the results presented in this report and the 2015/16 Social Accounting Matrix of Ethiopia are available on the public website "Data portal of agro-economic Modelling" (DataM) run by JRC. Links can be also accessed with the below QR codes.

Figure A3.1. QR code – DataM URL

https://datam.jrc.ec.europa.eu

Source JRC, 2017.

Using DataM users can access and analyse main results of the report through an interactive infographics

Figure A3.2. QR code – RJOC Report

https://datam.jrc.ec.europa.eu/datam/mashup/RJOC_ETHIOPIA

Source JRC, 2019.

Using DataM, users can make a bulk download of the SAM in a ZIP file (Dataset_JRC_-_Social_accounting_matrix_-_Ethiopia_-_2015_16.zip) containing a homonymous CSV file. The hyperlink for the direct bulk download is in Figure A3

Figure A3.3. QR Code –bulk download Ethiopian SAM

https://datam.jrc.ec.europa.eu/datam/perm/dataset/fac56b11-140a-46fa-9ae1-8b67e7dc0dcc/download/Dataset_JRC_-_Social_accounting_matrix_-_Ethiopia_-_2015_2016.zip

Source JRC, 2019.

For the SAM, users may explore and analyse the data through an interactive dashboard placed in the home page of the website (Figure A4) under the PANAP section[14].

Figure A3.4. QR Code –dashboard Ethiopian SAM

https://datam.jrc.ec.europa.eu/datam/mashup/SAM_ET_201516

Source JRC, 2019.

Furthermore, based on the Social Accounting Matrix, the DataM "jobs calculator" allows making easy interactive simulations of the effects on employment in Ethiopia due to changes in export of given products or services.

[14] The organization in sections of the home page of DataM might change in the future, however the direct links to dashboard and files, and realted QR codes, are permanent.

Figure A3.5. QR Code –Jobs calculator for Ethiopia

https://datam.jrc.ec.europa.eu/datam/mashup/JOBS_CALCULATOR?SAM=ET

Source JRC, 2019.

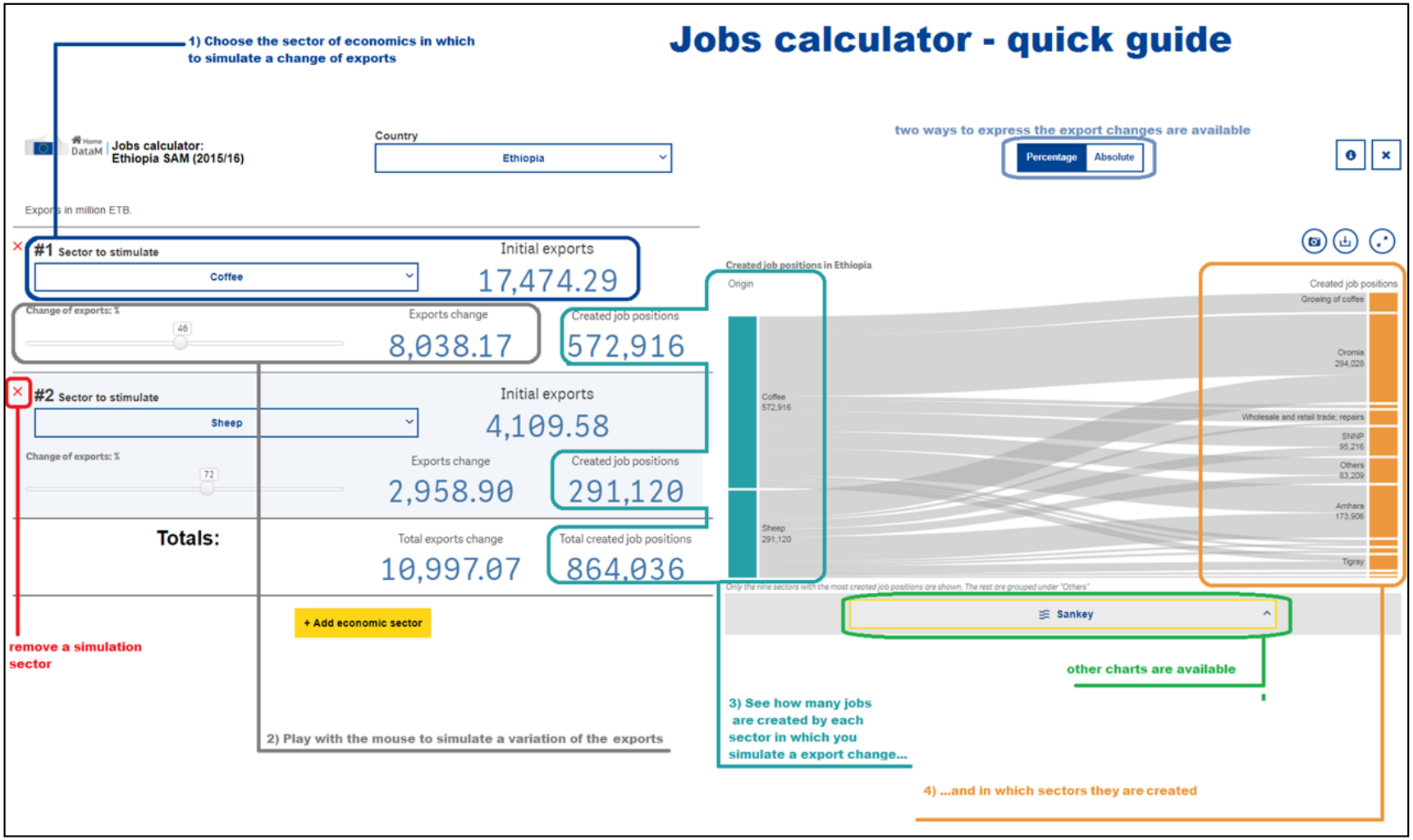
To date, the job calculator works also, at time of writing, with EU and 2 other African countries.

Figure A3.6. QR Code – Jobs calculator

https://datam.jrc.ec.europa.eu/datam/mashup/JOBS_CALCULATOR

Source JRC, 2019.

Figure A3.7. Jobs calculator quick guide



Source: JRC, 2019.

Note: This is the look-and-feel of the user interface of the calculator at time of writing. We cannot exclude future changes aiming to improve its ergonomics or functionalities, even if based on the same basic mechanism here explained

Finally, DataM offers the "Country Dashboards" a one-stop-shop infographics about food/nutrition security and relevant macroeconomics and agro-economic indicators produced by several organizations and gathered by country.

Figure A3.8. QR Code –Country Dashboards

https://datam.jrc.ec.europa.eu/datam/mashup/COUNTRY_DASHBOARDS

Source JRC, 2019.

Find below the direct link to the fiche of Ethiopia.

Figure A3.9. QR Code – Country Fiche of Ethiopia

https://datam.jrc.ec.europa.eu/datam/mashup/COUNTRY_DASHBOARDS?iso2=ET

Source JRC, 2019.

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